Hannah Janßen[1,2,3], Elisabeth Dütschke[1], Sabine Preuß[1]

Citizens' Evaluation of Sufficiency Policies in the Field of Housing. The Role of Communication and Personal Affectedness.[4]

Abstract: Using citizen surveys conducted in Denmark, France, Germany, Italy and Latvia, this paper examines perceptions of two strict sufficiency-oriented policies, focusing on whether the perceptions vary with different framings of the policy objectives and explores the role of personal affectedness by the policy measures. For the framing the policy measures are presented to either aim at "punishing" or "overcoming" unsustainable housing choices. The impact of the framing is tested in general and, in addition, it is investigated whether the impact of the framing varies when respondents will potentially be affected by the policy measures. As a case study, the paper concentrates on sustainable housing and, more specifically, on limiting living space per person, including two policy measures, namely (1) a ban on the construction of new single-family homes that are standard-sized or larger and (2) a financial fee on

1 Fraunhofer Institute for Systems and Innovation Research ISI, Breslauer Straße 48, 76139, Karlsruhe, Germany

2 University of Bern, Switzerland

3 corresponding author: hannah.janssen@isi.fraunhofer.de

4 Written under supervision of Prof. Isabelle Stadelmann-Steffen, University of Bern, Switzerland.

above average living space. We find that both strict sufficiency-oriented policies are perceived rather negatively in all countries. The impact of the framing on policy evaluation seems limited and does not vary for personal affectedness, however in two countries (in Germany and Italy) the fee is evaluated more positively when the policy objective is framed as "overcoming" unsustainable housing choices. Variables that have been found to be statistically significantly associated with the evaluation of the ban and fee in at least two countries are familiarity with the measures, trust in national politicians, political orientation, and finding the provision of sufficient sustainable housing a problem.

Keywords: Sufficiency, policy perception, policy evaluation, framing

Introduction

The concept of sufficiency and sufficiency lifestyles is gaining increasing attention in the debate on the energy transition or, more broadly, the sustainability transition. The interest in the sufficiency concept has been triggered by a number of developments, including (i) the recognition that current technology--driven innovation pathways will not be able to deliver the required levels of decarbonisation as quickly as needed; (ii) a growing understanding that even with technological innovation, solving current sustainability challenges will require changes in lifestyles and daily practices; (iii) lessons from recent crises, such as the COVID-19 pandemic and the energy crises, that short-term lifestyle changes are possible, but also necessary, to cope with the impacts of these crises and (iv) issues of climate justice, including the responsibility of high CO_2 emitting countries to drastically reduce their negative impact on the world's climate. For instance, the average carbon footprint of EU citizens is well above the world's average (EEA, 2019). Sufficiency can be understood as creating the social, infrastructural, and regulatory conditions for changing individual and collective lifestyles in a way that reduces energy demand and greenhouse gas emissions to an extent that

they are within planetary boundaries, and simultaneously contributes to societal well-being (Tröger et al., 2022). In this vein, some studies (e.g. Bourgeois et al., 2023) have suggested that there is a list of demand-side changes that are likely to be effective in saving energy and reducing carbon emissions, while producing co-benefits such as improved health (Creutzig et al., 2021). However, the concept of sufficiency is also sometimes contested, being perceived as compromising comfort and living standards and potentially exacerbating inequality and increasing poverty for some. Even in countries with on average high living-standard and high CO_2 emissions, some groups are facing poverty and might be unable to meet basic needs. When discussing sufficiency and further, policies aiming at sufficiency, the potential impact for different societal groups has to be taking into account.

While scientific and policy debates are ongoing, this paper focuses on the citizen's perspective on sufficiency, starting from the assumption that sufficiency lifestyles, as lifestyles in general, are shaped and re-enacted by individual behaviour and socio-technical structures, and that collective lifestyle changes require policy measures to support them to adapt structures accordingly (Hirth et al., 2023). Fostering the structural changes needed for such adaptations is again a societal task that requires the support of society, so citizens are relevant in this context as consumers/users who make lifestyle choices, but also as citizens who are decision-makers in a democratic society (Defila et al., 2018). In this paper, we focus on the citizens in this second role and thus their perceptions of sufficiency policies. We investigate the relevance of how sufficiency policy measures are communicated using linguistic frames (comparing two versions of framing of the objective of the policy measures). However, not all citizens live on large living space, and thus, they would have to change their behaviour to different degree in response to the policy measures investigated. Therefore, in addition we want to explore whether the effect of the framings is dependent on whether a person is affected by the policy measures.

Literature

In this section the concept of sufficiency is discussed, followed by a brief overview of citizens' perceptions of sufficiency and policy measures as well as the role of frames for policy perceptions. Subsequently, an introduction to the research case, namely housing, is given. Last, the research questions are presented.

Definitions of sufficiency

Sufficiency is understood differently in the debate. It has been characterised as a demand-side or behavioural approach as opposed to a supply-side approach to decarbonisation and energy system transformation or as a 'beyond technology' option (Creutzig et al., 2016; Sandberg, 2018). In this understanding it encompasses measures like turning down the thermostat to reduce the room temperature or switching off appliances completely when not in use to avoid standby consumption. Other authors describe it as a third strategy for achieving a more sustainable way of life, alongside consistency and efficiency (Fischer & Grieshammer, 2013). In such an understanding, sufficiency refers to a qualitative or quantitative change in the way services are provided or used, e.g. by changing mobility by avoiding trips or switching from driving to cycling as a more environmentally friendly mode of transport; other examples are cohousing or sharing practices. Efficiency, on the other hand, is about increasing output relative to input, for example by getting more people to use the same means of transport through carpooling or more efficient heating systems that use less fuel to keep rooms warm and comfortable. Finally, consistency refers to changes in technology that have a lower environmental impact while delivering the same outcome or service, such as the shift to electric mobility or heat pumps. Other authors see the sufficiency debate within the context of questions around degrowth and fundamental changes of the economic system, arguing for an emphasis on public welfare instead of accumulation (cf. literature review by Jungell-Michelsson & Heikkurinen, 2022). These examples point out that an analysis of

sufficiency could reach from small changes on the micro level to overturning societal structures. In this paper we take a mid-way approach and understand sufficiency as creating the social, infrastructural, and regulatory conditions for changing individual and collective lifestyles in a way that reduces energy demand and greenhouse gas emissions to an extent that they are within planetary boundaries, and simultaneously contributes to societal well-being (Tröger et al., 2022).

Perceptions of sustainability policies and sufficiency

Research has shown that sustainability policies such as climate policies gain support when they are perceived to be fair, effective and do not have negative personal effects (Dechezleprêtre et al., 2022). Other findings suggest that citizens are usually more sceptical towards more costly and more restrictive measures (Huber & Wicki, 2021). With regard to sufficiency, a recent study by Lage et al. (2023) points out that citizens, in contrast to policymakers and national governments, support regulatory measures aimed at sufficiency lifestyles. These results were obtained in citizens' conferences, where citizens were exposed to climate issues in depth before making evaluations, so the results may be specific to a context in which citizens are more knowledgeable.

The role of framing for policy perceptions

By employing framing in experiments, researchers can understand how different framings influence attitudes, opinions and policy evaluations. This knowledge helps policymakers optimise communication strategies, emphasising benefits and aligning with societal values. Framing experiments offer a systematic approach to grasp how language and presentation shape public perceptions of policies in diverse contexts. It has been shown that even relatively simple changes in the wording of policy framing can affect perceptions, for example in the case of transport policy (Oltra et al., 2023) or housing policy (Schnepf et al., 2023).

Case study: sufficiency in the housing sector

This paper builds on the existing body of knowledge and examines sufficiency policies in the housing sector as a case study. The housing sector significantly contributes to global greenhouse gas emissions. According to the International Energy Agency (IEA), the buildings sector, which includes the energy used for construction, heating, cooling, lighting, and operating equipment, accounts for one-third of global energy consumption and emissions.[5] Therefore, decarbonizing the housing sector is crucial for climate change mitigation. Despite numerous measures implemented to achieve this goal, emissions in the housing sector have remained relatively constant in recent years.[6]

The emissions and energy use in the housing sector encompass a wide range of activities and functions. Housing is essential for providing shelter from climatic conditions, facilitating social and cultural life, and enabling economic activities. The challenge lies in balancing the need for housing with the imperative to decarbonize. One promising approach is to examine the amount of living space required for these activities without compromising their quality.

The amount of living space per person is a critical factor in this context. In many European countries, living space per person has increased over the past decades. Generally, increased living space leads to higher energy consumption and carbon emissions due to the greater need for heating, cooling, and construction resources (Lorek & Spangenberg, 2019). Thus, reducing the living space per person emerges as a sufficiency measure that can enhance the sustainability of housing (Ellsworth-Krebs, 2020).

Research questions and research case

Taking together the lines of thinking outlined above, this paper empirically studies the perceptions of citizens across Europe (in Denmark, France, Germany, Italy and Latvia) on sufficiency po-

5 https://www.iea.org/energy-system/buildings (18/05/24)

6 https://building-stock-observatory.energy.ec.europa.eu/factsheets/ (18/05/24)

licies in the housing sector, more specifically policies addressing the reduction of living space per person. The following two stricter policy measures are investigated: (1) a ban on the construction of single-family homes that are standard size or larger and (2) a financial fee on above average living space. Linguistic frames are applied to understand whether different communication about the aim of the policies has the potential to influence policy perception. In addition, we want to focus on personal affectedness by a policy measure. Negative personal impacts for the individuals themselves has been found to be associated with lower support for climate policies (Dechezleprêtre et al., 2022). However, the idea behind stricter sufficiency policies is that they have an impact on individuals who consume more resources and emit more CO2, and induce them to change their behaviour. Because of their binding nature, stricter policies such as bans and mandatory fees can be very effective in mitigating climate change. Stricter policies could therefore be an important step towards more sustainable lifestyles. In addition, from a normative social justice perspective, individuals who contribute more to overconsumption (who are often more wealthy and have profited from economic advances connected to an increase of CO2eq emissions) should be the ones to change their behaviour and reduce personal emissions. Hence, personal affectedness by the policy measure will be taken into account.

Adding to the current knowledge, the proposed paper examines

1. perceptions of sufficiency-oriented policies in the housing sector
2. whether the evaluation of policy measures varies with different framings of the policy objectives and
3. if the framing has different effects for individuals who will be affected by the policy measures

Methods

The data the paper draws on was collected as part of the project FULFILL - Fundamental decarbonisation through sufficiency by lifestyle changes[7]. The aim of the EU-funded research project is to explore the contribution of lifestyle changes and citizen engagement in decarbonising Europe and fulfilling the goals of the Paris Agreement.

A quantitative approach is used for the purpose of the present study, using citizen surveys. The FULFILL project conducted extensive micro-level online surveys in five EU Member States as part of its workplan with a total sample of n = 3642 respondents (786 in Denmark, 784 in France, 763 in Germany, 774 in Italy and 535 in Latvia).

Design of the survey

The survey was part of the second wave of the project. The first survey wave was designed to look at the current carbon footprint and well-being of European citizens in order to determine the prevalence of sufficiency lifestyles in contemporary societies. This survey was conducted in 2022. The second survey which took place in 2023 was divided into several subsamples focusing on either the perception of policies in two areas, namely housing and food, or the prevalence of sufficiency lifestyles. For the purposes of this paper, the data from the housing survey will be analysed. All surveys were conducted online using a standardised questionnaire developed by the project team.

Approximately 750 to 800 respondents in Denmark, France, Germany and Italy and approximately 550 respondents in Latvia were recruited via a professional market research institute (Norstat) for the housing study. The online survey was conducted using EFS Tivian software and data collection took place between May and August 2023. Quota sampling was used to ensure representativeness in terms of gender, age, income and region

7 https://fulfill-sufficiency.eu/

in each country. The quotas corresponded to the distribution of the quota characteristics of the target country. Apart from small deviations in terms of regions in Germany and age groups in Denmark, the targets were met and samples are thus largely representative for the adult population.

The questionnaire was structured as follows (Figure 1): It first examined perceptions of two exemplary sufficiency policies in the housing sector (1) a ban on the construction of new single-family homes of standard size or larger, and (2) an annual financial fee for homes with above-average living space. These policy measures were chosen as they have been discussed in the context of sufficiency policies in the housing sector in Europe and because they are assumed to be effective. Studying these perceptions was embedded in an experimental design applying linguistic framing. In addition, a series of post-experiment questions explored, for instance, affectedness and perceptions of the respondents' own situation. Further questions e.g. on socio-demographics completed the questionnaire.

At the start of the survey, respondents answered questions designed to fill the quota. By monitoring the sample composition based on these questions, the samples were kept representative. Therefore, these questions were presented by the market research institute recruiting the participants. Next the participants saw a short introductory text that gave them an overview of the study content, some information on data protection and related issues and asked them to provide valid answers. Then the questionnaire continued with the direct presentation of one of the two policies under investigation. The experimental part consisted of a framing experiment, i.e. the introduction to the two policies was varied in such a way that the aim of the policies was either explained as 'overcoming' unsustainable choices, as 'punishing' them, or no explanation of the specific aim was included (loosely following the approach by (Schnepf et al., 2023)). Participants were randomly assigned to one of the three conditions.

After reading the information about the policy, participants answered questions about their perceptions of the policy. Before

that participants were asked whether they had heard of the policy before the survey, to measure familiarity. This was followed by a series of evaluation questions, all designed as five-point Likert scale questions. First, to obtain information on perceived justice or fairness, respondents were asked how much they agreed with the statement that the policy measure is fair from a societal perspective, on a scale ranging from (1) strongly disagree to (5) strongly agree. Second, to measure perceived affectedness, respondents were asked to indicate whether they think they would be affected by the policy measure personally positively or negatively on a scale ranging from (1) very negatively to (5) very positively. Third, overall policy acceptability was measured by asking respondents whether they supported or opposed this policy measure, with the scale ranging from strongly opposed to strongly supported.

The second policy measure, i.e. the ban or the fee, was then presented in the same way and with the same framing as the first, and the same questions were asked again now for this measure. Thus, all participants evaluated both policies, but the order was randomised. The framing was kept constant for each participant. At the end of the policy questions, participants were asked a question to check whether or not they correctly recall the framing condition from the experiment (manipulation check).

The policy part was followed by a series of questions about the current living situation, energy consumption, satisfaction with the situation, additional demographics such as household composition, etc. To operationalize personal affectedness regarding the ban, respondents were asked for their preferred type of housing (e.g. living in a single-family home) and regarding the fee respondents were asked for their current living space.

Some data cleaning procedures were carried out to ensure data quality. This included excluding participants who were identified as speeders (participation time less than 30% of the mean response time), who did not answer two questions included as an attention check correctly, etc.

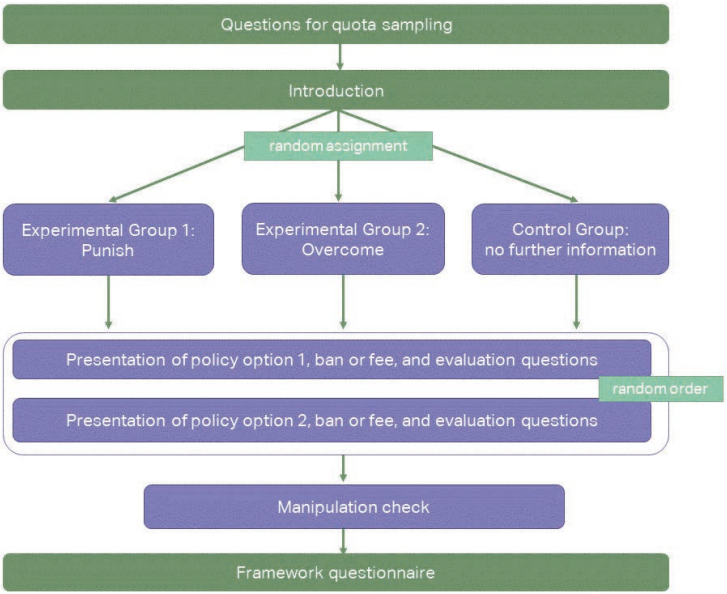

Figure 1 Overview on the questionnaire design

Analytical approach

The questionnaire data was analysed using descriptive statistics, statistical tests for difference such as analysis of variance (ANOVA) and multivariate linear regression models (OLS) including interaction terms. For the analysis of the framing including ANOVA and regression models, a reduced sample size was used (353 respondents in Denmark, 272 in France, 328 in Germany, 297 in Italy and 196 in Latvia), as only respondents from the two framing conditions were analysed who were able to recall the framing (manipulation check).

Hierarchical linear regression analyses (OLS) were conducted for each country separately. As dependent variable we used and index formed across the different evaluation items for the policies[8]. Thus, the dependent variable can be considered to have a metric scale[9]. We applied a hierarchical approach: in a first

8 For more information on the variables used, see Table 4 in the Appendix.

9 For both hard policy measures and all countries, the assumptions for running a linear OLS regression were met.

step of the regression, only the control variables were added to the model, including: (a) socio-demographic variables (e.g. income, employment situation, education), (b) variables related to the relationship with the political system, such as trust in national politicians and whether they feel that people like them have a say in what the government does, (c) variables that have been found to be generally related to pro-environmental behaviour, such political orientation and environmental identity (d) added by problem awareness and familiarity with the political measure. In the next step of the hierarchical regression, the variable for the experimental condition (framing) and a measure for personal affectedness were added. For the ban personal affectedness was operationalized as preferring to live in a single-family home and for the fee whether respondents live in homes with above average living space per person. In the final step of the hierarchical models the interaction term of the framing group and personal affectedness was included. The dependent variable and covariates used in the analysis are described in Table 4 in the Appendix.

Results

In the following, the results will be discussed. First, perceptions of the sufficiency policies for all respondents will be presented. Second, we will assess using ANOVAs whether the framing regarding the aim of the policy measures has an effect on the evaluation of the policy measures. Third, we will present results of multivariate linear regression models to a) examine the effect of the framing on policy evaluations when we control for various variables and b) whether the effect of the framing is dependent on personal affectedness (interaction). In addition, findings regarding other relevant predictors of policy evaluation besides the framing and interaction will be reported.

Perceptions of sufficiency policies

On the basis of the survey, perceptions can be reported on the two sufficiency measures for the housing sector: (1) the ban on

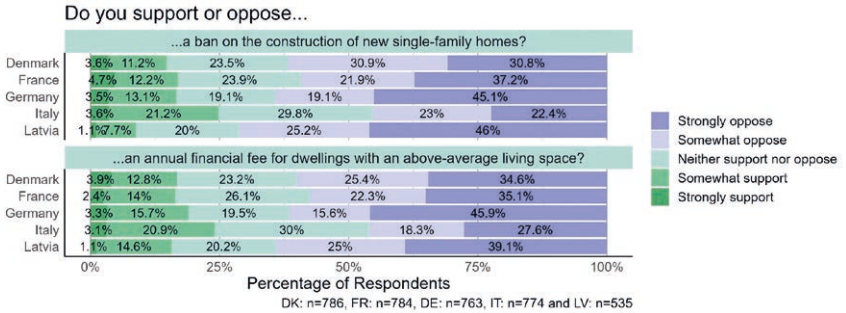

Figure 2 Acceptability of investigated policy measures

the construction of new single-family houses of standard size or larger, and (2) the annual financial fee for dwellings with above--average living space.

Figure 2 shows the frequencies of responses for acceptability. In general, the ban on the construction of new single-family homes (standard size or larger) and the fee for above-average dwellings are rated similarly in all five countries: In all countries except Italy and for both policy measures, more than 50% of respondents indicated that they strongly or somewhat oppose the proposed policy measures. The highest proportion of respondents opposed (including somewhat and strongly opposed) to both policies is found in Latvia (over 60%). In Italy, the proportion of somewhat or strongly opposed respondents is slightly lower than in the other countries, at around 45% for each of the policies. In most countries (Denmark, France and Germany) the proportion of respondents somewhat or strongly in favour of each

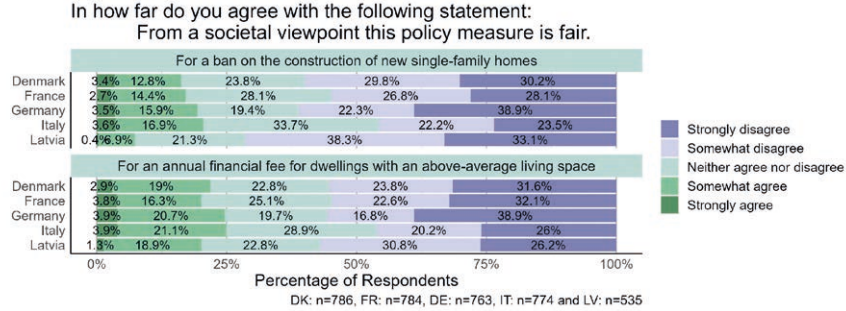

Figure 3 Perceived fairness of investigated policy measures

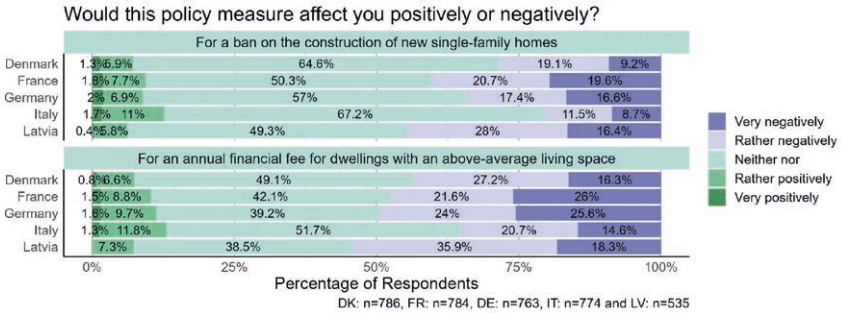

Figure 4 Perceived affectedness of investigated policy measures

policy measure is between 15% and 20%. In Latvia, the proportion of respondents supporting the ban is lower than in the other countries, while in Italy the proportion of support is higher for both policies (around 25%).

Following Dechezleprêtre et al. (2022) perceived fairness (Figure 3) and impact on the respondents (perceived affectedness, Figure 4) were also examined in addition to acceptability. The overall pattern is similar to the responses to the acceptability question: In all countries except Italy, more than 50% of respondents somewhat or strongly disagree with the statement that the policy measures are fair, while the ban is perceived as slightly less fair than the fee. Latvia has the highest proportion of respondents who somewhat or strongly disagree with both measures, while Germany has the highest proportion of respondents who strongly disagree. Fewer respondents in Italy disagree than in the other countries for both policies. However, even in Italy, the proportion of respondents who perceive both policies as unfair is high at around 45%.

Figure 1Figure 4 **Fehler! Verweisquelle konnte nicht gefunden werden.** shows the distribution of frequencies of the responses in percent for the question whether the policy measure would affect the respondents positively or negatively. In comparison to the evaluation questions presented before, for the perceived affectedness, a large share of respondents indicated the middle category, meaning that they think they will neither be affected negatively nor positively by the measures (ranging from

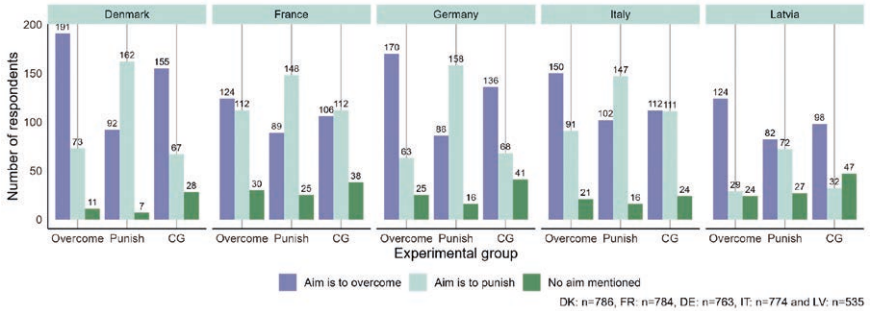

Figure 5 Responses to manipulation check

39% to 67%). Across countries, this share of respondents stating neither nor is larger for the ban than for the fee. For the fee, more respondents think that they will be rather or strongly negatively affected. Overall, the share of respondents stating that they will be positively affected is smaller than the share of respondents indicating to be negatively affected (between 6% and 13% for each hard policy measure). Again, especially negative evaluations regarding the perceived affectedness can be found in Latvia and less negative evaluations in Italy for both measures.

Due to the high similarity of the results between the evaluation questions, we carried out checks to analyse the internal consistency (Cronbach's alpha), which was >.9 for all countries. This points out that people were highly consistent in their rating of the various aspects. Therefore, the different questions were combined into one measure of evaluation for further analysis.

Changes in perception based on different framings: Results of ANOVAs

In order to test whether the framings had an effect on the evaluation of the policy measures, the mean value of the evaluation of the policy measures were compared between the experimental groups.

In a preparatory step, we checked whether the respondents selected the correct answer in the manipulation check. For the manipulation check, respondents were asked for the aim of the policy measures presented to them. The respondents could se-

lect one of the following response options 1) "to overcome unsustainable housing choices" 2) "to punish unsustainable housing choices" and 3) "no aim was mentioned".

Figure 5 shows one bar graph per country showing the distribution of responses to the manipulation check, differentiated by experimental group (experimental group 1: Overcome, experimental group 2: Punish and control group (CG)). In the overcoming condition, the majority of respondents in each country chose the correct answer in the manipulation check, namely that the aim of the policy is to overcome unsustainable housing choices (purple bar). In the punish group, most respondents in all countries except Latvia chose the correct answer ("the aim of the policy is to punish unsustainable housing choices", see light blue bar). In the control condition, the correct answer would have been that no aim was mentioned, but in none of the countries this is the most common answer.

The manipulation check showed that most respondents in the two experimental conditions chose the correct answer, but in the control condition most respondents did not. We therefore decided to include in the following analysis only those respondents who correctly identified the experimental condition. As these were few in the control group, this meant that we focused on the two experimental groups (353 respondents in Denmark, 272 in France, 328 in Germany, 297 in Italy and 196 in Latvia).

Table 1 Comparison of means for the evaluation both policy measures, subsample[10]

	Ban			Fee			
	Mean: overcome	Mean: punish	Results ANOVA	Mean: overcome	Mean: punish	Results ANOVA	n
Denmark	2.66	2.33	***(p< 0.01)	2.52	2.28	***(p< 0.01)	353
France	2.71	2.28	***(p< 0.01)	2.57	2.18	***(p< 0.01)	272
Germany	2.56	2.23	***(p< 0.01)	2.61	2.19	***(p< 0.01)	328
Italy	2.88	2.66	*(p < 0.10)	2.83	2.54	**(p< 0.05)[10]	297
Latvia	2.39	2.20	n.s. (p>0.1)	2.44	2.24	n.s. (p>0.1)	196

[10] As the variances have been found to not be homogenous, we calculated a Welch ANOVA

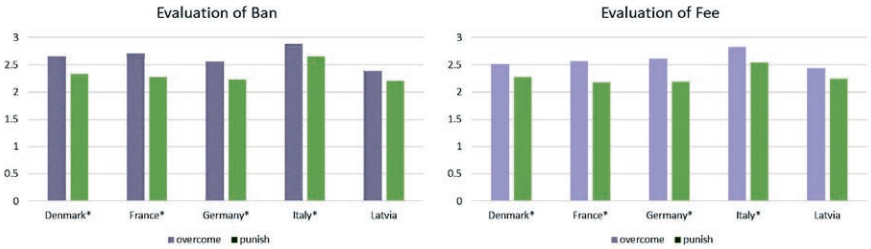

Figure 6 Evaluation of the investigated policy measures by framing, subsample

Effects of the framing are investigated by means of analysis of variance (Table 1 and Figure 6). We find significant differences in line with the framing except for Latvia. As the Latvian sample is smaller, this is possibly due to lack of statistical power as the patterns are similar. However, in Latvia the average change in ratings is also lowest.

Predictors of the evaluation of the policy measures: Results of the linear regressions

In a next step multivariate models (linear regressions) were calculated to (1) further investigate the potential effect of the framing on the evaluation of the policy measures when control variables are included and (2) to test whether the framing had a different effect for respondents that would be more affected by the policy measure. Only respondents from the two experimental conditions were included who were able to correctly recall the framing.

In the following the results for the linear regressions (OLS) are presented (for the final models, containing the control variables, the predictors and the interaction term). In all countries, except for Latvia the models were statistically significant and the variance explained by the model increased compared to a model with only control variables. Results for Latvia are not presented as the model fit is too poor which might be related to the smaller sample size in Latvia. First, findings for the ban for all countries are discussed, followed by the presentation of the results for the fee.

Results for the ban

Table 2 shows the results for the linear regressions (OLS) for all countries (except for Latvia)[11]. In the multivariate models, containing various control variables, no relationship between the framing and evaluation of the ban could be identified. In addition, no statistically significant effects are found for the interaction term included to examine whether the effect of the framing on the evaluation of the ban is dependent on affectedness (here operationalized as preferring to live in a single-family home in the future). Affectedness alone was also not found to be statistically significant. Variables that are statically significantly correlated to evaluation of the ban, ceteris paribus, in at least two countries are: having higher trust in national politicians (for Denmark and Germany), political orientation (support of national policies (-) in Italy, support of social policies (+) in France and Denmark, support of liberal policies (-) in Germany, support of environmental policies (+) in Denmark), finding the provision of sufficient sustainable housing a problem in Denmark and France and familiarity with the ban in Germany and Italy.

Table 2 Results of the linear regression for the evaluation of the ban

	Dependent variable:			
	Evaluation Ban			
	Denmark	France	Germany	Italy
Income per person (in 1T€)	-0.004	-0.006	-0.007	-0.006
	(0.002)	(0.005)	(0.004)	(0.006)
Working	0.019	0.034	0.027	0.108
	(0.103)	(0.149)	(0.145)	(0.142)
Higher education	-0.010	0.075	-0.148	-0.178
	(0.120)	(0.150)	(0.150)	(0.132)
Female (vs. male)	-0.063	0.116	0.051	0.143
	(0.097)	(0.136)	(0.124)	(0.139)
Age	0.0001	-0.004	-0.001	-0.001
	(0.003)	(0.005)	(0.005)	(0.005)

[11] Sample sizes are reduced due to missing values in control variables, such as city. The final sample sizes can be found in the regression tables.

City (vs. rural)	0.080	-0.168	0.108	-0.053
	(0.093)	(0.146)	(0.134)	(0.136)
Trust national politicians	0.121**	-0.009	0.227**	0.056
	(0.044)	(0.081)	(0.074)	(0.079)
Say in what government does	0.062	0.114	0.101	0.091
	(0.042)	(0.071)	(0.066)	(0.081)
Support national policies	0.024	-0.051	0.080	-0.201*
	(0.050)	(0.091)	(0.063)	(0.081)
Support social policies	0.054	0.193*	-0.081	0.206*
	(0.056)	(0.089)	(0.073)	(0.098)
Support liberal policies	-0.053	-0.139	-0.124*	-0.073
	(0.054)	(0.088)	(0.061)	(0.077)
Support environmental policies	0.165*	0.029	0.109	0.058
	(0.071)	(0.096)	(0.081)	(0.115)
Support conservative policies	0.025	0.084	-0.016	0.061
	(0.060)	(0.073)	(0.065)	(0.067)
Environmental identity	0.021	-0.087	0.041	0.201*
	(0.056)	(0.086)	(0.077)	(0.100)
Problem awareness sustainable housing	0.338***	0.154*	0.098	-0.014
	(0.055)	(0.073)	(0.056)	(0.067)
Heard of ban	0.228	0.027	0.445**	0.604**
	(0.122)	(0.185)	(0.138)	(0.223)
Framing: Overcome (vs. punish)	0.125	0.370	0.115	0.034
	(0.126)	(0.219)	(0.234)	(0.203)
Preference single-family home	-0.124	-0.089	-0.351	-0.371
	(0.135)	(0.199)	(0.183)	(0.190)
Interaction: Framing: Punish (vs. overcome)*Preference single-family home	0.089	-0.349	0.239	0.289
	(0.179)	(0.272)	(0.276)	(0.269)
Constant	0.329	1.705**	1.560**	2.458***
	(0.422)	(0.522)	(0.558)	(0.646)
Observations	249	190	227	202
Adjusted R2	0.426	0.126	0.227	0.181
Note: Standard errors in parenthesis.	*p <0.05 **p<0.01 ***p<0.001			

Results for the fee

Table 3 presents the results of the linear regression (OLS) regarding the evaluation of the fee on above average living space[12]. In the multivariate model including control variables, the framing has a statistically significant effect in Germany ($p < 0.05$) and Italy ($p < 0.05$), ceteris paribus. For both countries, respondents who were able to recall the framing, evaluated the policy measure more favourably when they were presented with the aim of the policy measure being to overcome unstainable housing choices instead of punishing these choices. The tested interaction effect between the framing condition and being more affected (operationalized as having above average living space) is not statistically significant in either country nor is affectedness alone. Variables that are statistically significantly correlated, ceteris paribus, to a more positive evaluation of the fee in at least two countries are: higher trust in national politicians in Denmark and Germany, feeling like having a say in what the government does in Denmark and Italy, political orientation (support of national polices (+) in Denmark, support of environmental policies (+) in Germany), finding the provision of sufficient sustainable housing a problem in Denmark, France and Germany and having heard of the fee before (+) in all four countries.

Table 3 Results of the linear regression for the evaluation of the fee

	Dependent variable:			
	Evaluation Fee			
	Denmark	France	Germany	Italy
Income per person (in 1T€)	-0.003	-0.009	-0.003	0.0005
	(0.003)	(0.006)	(0.004)	(0.006)
Working	0.023	-0.116	-0.068	-0.007
	(0.109)	(0.157)	(0.139)	(0.152)
Higher education	0.157	0.087	-0.273	-0.230
	(0.128)	(0.158)	(0.147)	(0.139)
Female (vs. male)	0.001	0.128	-0.001	0.187
	(0.102)	(0.146)	(0.120)	(0.144)

[12] Sample sizes are reduced due to missing values in control variables, such as “city”. The final sample sizes can be found in the regression table.

Age	0.002	0.002	-0.006	-0.001
	(0.004)	(0.005)	(0.004)	(0.005)
City (vs. rural)	0.171	-0.024	0.053	-0.134
	(0.097)	(0.150)	(0.131)	(0.141)
Trust national politicians	0.127**	0.095	0.179*	0.011
	(0.047)	(0.086)	(0.071)	(0.082)
Say in what government does	0.105*	-0.008	0.108	0.173*
	(0.045)	(0.077)	(0.065)	(0.085)
Support national policies	0.173**	-0.139	-0.044	-0.157
	(0.054)	(0.097)	(0.062)	(0.085)
Support social policies	-0.026	0.172	-0.008	0.183
	(0.060)	(0.094)	(0.071)	(0.102)
Support liberal policies	-0.043	-0.084	-0.043	-0.107
	(0.058)	(0.094)	(0.059)	(0.081)
Support environmental policies	0.087	0.045	0.237**	0.052
	(0.076)	(0.102)	(0.080)	(0.121)
Support conservative policies	-0.065	0.052	-0.030	-0.009
	(0.063)	(0.077)	(0.063)	(0.071)
Environmental identity	0.040	-0.006	-0.016	0.064
	(0.060)	(0.090)	(0.075)	(0.106)
Problem awareness sustainable housing	0.379***	0.207**	0.137*	0.039
	(0.058)	(0.078)	(0.055)	(0.069)
Heard of fee	0.344*	0.554*	0.633***	0.441*
	(0.150)	(0.277)	(0.164)	(0.223)
Framing: Overcome (vs. punish)	0.115	0.277	0.357*	0.375*
	(0.122)	(0.180)	(0.152)	(0.177)
Above-average living space	-0.083	0.101	-0.364	-0.125
	(0.152)	(0.196)	(0.186)	(0.208)
Interaction: Framing: Punish (vs. overcome)*Above-average living space	-0.121	-0.301	0.120	-0.240
	(0.195)	(0.279)	(0.241)	(0.285)
Constant	0.038	1.280*	1.167*	2.253***
	(0.434)	(0.542)	(0.521)	(0.646)
Observations	249	190	227	201
Adjusted R2	0.385	0.158	0.353	0.154
Note: Standard errors in parenthesis.	*p <0.05 **p<0.01 ***p<0.001			

When comparing the results for the ban on the construction of new single-family homes and the fee on above average living space, the results have similarities. For instance, for the evaluation of both political measures, trust in national politicians, political orientation, finding the provision of sufficient sustainable housing a problem and familiarity with the measure are statistically significant predictors for policy evaluation in at least two countries, ceteris paribus. For the framing, correlations for only two countries for the fee have been found and the interaction term is not statistically significant in either of the four countries for both measures.

Discussion and conclusion

This paper is positioned within the current debate on sufficiency as an approach to decarbonising Europe within the energy transition. The sufficiency approach is linked to a wider debate on changing the economic system that is deemed unsustainable, but also more simply as a means to achieve climate goals by reducing demand for energy services. This paper locates sufficiency at the lifestyle level as an interplay between individual choices and societal structures. For our empirical study, we take sustainable housing as an example and examine citizens' responses to two policies aimed at reducing per capita living space.

Summary of results

We find that the proportions of respondents who disapprove (45-75%) of both policies are higher than the proportions who approve (9-25%) - while the overall pattern is similar, there are differences between countries. As the evaluation of policy measures is associated in the literature with the perceived fairness and their impact on individuals (or their households), we also report findings on perceived fairness and perceived affectedness. The pattern for fairness is similar to that for acceptability (disapprove/ approve), with the ban being perceived as slightly less fair than the fee. The pattern is slightly different for perceived

affectedness: a larger share indicated that they will be affected neither positively nor negatively (39% - 67%) and more respondents expect to be negatively affected by the fee.

We also tried two different types of embedding the policy instruments by framing them as either to overcome or punish unsustainable choices. Drawing from the results of the analyses of variance conducted, when people recall the framing, i.e. have paid attention to it, this is likely to influence their ratings. However, when examining the effect of the framing in multivariate models (linear regressions) including various control variables, we find this effect of the framing only for the evaluation of the fee in Germany and Italy. For these two cases respondents who are able to recall the framing evaluate the fee on above average living space more positively when the aim of the policy measures is communicated as "overcoming" unsustainable housing choices compared to "punishing" them. Given that only one word was changed for the framing and that several relevant control variables are included, it is interesting that at least in two cases the framing had an effect. Hence, how we communicate about policy measures (e.g. framing the aim more positively or negatively) can potentially have an effect on the evaluation.

Further, we examined whether the effect of the framing is dependent on personal affectedness by the policy measures. Our results suggest that (1) the relationship between the framing and the evaluation of the ban does not differ for individuals who prefer to live in a single-family home and those who do not and (2) that the relationship between the framing and the evaluation of the fee does not differ for individuals who have above average living space and those who do not. In addition, personal affectedness has no direct relationship with the evaluation of the policy measures. These findings can be connected to arguments of responsibility and justice: The potential affectedness (living in a single-family home or having above average living space) is connected to choosing a lifestyle that is, in general, related to higher CO_2 emissions. From a social justice standpoint, it can be argued that the responsibility for reduction of emissions lies within the group

of people accountable for most of the emissions. While some individuals contribute to overconsumption, for instance by living on above average living space, other groups in society might not have enough means to cover their basic needs. Hence, following this argumentation, especially the group responsible for most of the CO_2 emissions should be targeted by sufficiency policies. As citizens' evaluation of policies can have an influence on policymaking (Kyselá et al., 2019), it is important to further understand whether affected individuals evaluate measures more negatively and whether their evaluation can be influenced by framing. We do not find that the preference to live in a single-family home (for the ban) or living on above average living space (for the fee) are related to policy evaluation. Hence, based on our findings these groups of citizens do not oppose these measures more than others[13]. Our findings are contrary to other studies that find a relationship of personal affectedness (e.g. the impact of the policy measure on the respondents' household is related to evaluation of climate change policies (Dechezleprêtre et al., 2022)). Potentially, this could be explained by the measurement of affectedness: while other studies often use perceived affectedness (by asking respondents to rate their affectedness on a scale[14]), for the regression models we operationalized affectedness by using data on current or future living decisions which could objectively be affected by the policy measures (e.g. whether respondents live in above average living space). Further, we do not find that the framing was more or less effective for potentially affected respondents. Therefore, for some cases (for the fee in Germany and Italy) communicating that the aim of the measure is to "overcome" unsustainable housing choices instead of "punishing" these choices can have a positive impact on policy evaluation – and this effect is not dependent on whether respondents are potentially affected by the measures.

13 Evaluations and acceptance of policies are not stable, but can change over time. Hence, public resistance especially by groups more affected could still occur, e.g. if policy measures are more prominent in public discourse.

14 In this study, we understood respondents' answer to the question "Would this policy measure affect you positively or negatively?" as a form of evaluation of the policy and thus included it in the index operationalizing policy evaluation.

Even though the results of the framing were insignificant in most cases, our findings from the control variables in the models suggest that communication about policy measures could be important. We find that familiarity with the policy measures was positively correlated to policy evaluation in Germany and Italy for the ban and in all countries for the fee.

Overall, we find similar results for the ban and the fee when it comes to all research questions (perceptions of the policy measures, the effect of framing and the interaction between framing and being affected). This also holds true for the statistically significant relationships we find in the regression models for at least two countries: besides familiarity with the measures, trust in national politicians, political orientation, and finding the provision of sufficient sustainable housing a problem are related to the evaluation of both policies (for at least two countries).

In conclusion, our findings suggest that current European societies are still sceptical about a radical shift towards sufficiency with strong political action (compare the overall negative evaluations of the two policy measures investigated), but that communication about the measures could in some cases be a tool to gain more public support for strict sufficiency policies (compare (1) the effect of framing for all countries except Latvia found in the ANOVAs and for Germany and Italy for the fee in the regression models and (2) the relevance of familiarity with the measures). However, the impact of mere linguistic framing should not be overestimated. The two policy measures examined, namely the ban on the construction of new single-family homes and the fee on above average living space, are two stricter measures designed to induce a change in the behaviour of individuals who have, or plan to have, larger living spaces. As larger living space is associated with overconsumption and higher CO_2 emissions, targeting these individuals can be considered to be just. At this stage and using the operationalization we chose for affectedness, the personally affected individuals do not seem to be particularly opposed to the policy measures and the framing does not seem to be less effective for them.

Funding

This research benefitted from funding by the European Union's Horizon 2020 Framework Programme under the project FULFILL - Fundamental decarbonisation through sufficiency by lifestyle changes (Grant agreement ID 101003656).

Literature

Bourgeois, S., Taillard, N., Balembois, E., Toledano, A., Gabert, A., Marignac, Y., Baudelet, F., & Teysset, S. (2023). *Climate neutrality, Energy security and Sustainability: A pathway to bridge the gap through Sufficiency, Efficiency and Renewables*. Final report. https://clever-energy-scenario.eu/wp-content/uploads/2023/10/CLEVER_final-report.pdf

Creutzig, F., Fernandez, B., Haberl, H., Khosla, R., Mulugetta, Y., & Seto, K. C. (2016). Beyond Technology: Demand-Side Solutions for Climate Change Mitigation. *Annual Review of Environment and Resources*, *41*(1), 173–198. https://doi.org/10.1146/annurev-environ-110615-085428

Creutzig, F., Niamir, L., Bai, X., Callaghan, M., Cullen, J., Díaz-José, J., Figueroa, M., Grubler, A., Lamb, W. F., Leip, A., Masanet, E., Mata, É., Mattauch, L., Minx, J. C., Mirasgedis, S., Mulugetta, Y., Nugroho, S. B., Pathak, M., Perkins, P., . . . Ürge-Vorsatz, D. (2021). Demand-side solutions to climate change mitigation consistent with high levels of well-being. *Nature Climate Change*. Advance online publication. https://doi.org/10.1038/s41558-021-01219-y

Dechezleprêtre, A., Fabre, A., Kruse, T., Planterose, B., Chico, A. S., & Stantcheva, S. (2022). *Fighting Climate Change: International Attitudes Toward Climate Policies*. https://doi.org/10.3386/w30265

Defila, R., Di Giulio, A., & Ruesch Schweizer, C. (2018). Two souls are dwelling in my breast: Uncovering how individuals in their dual role as consumer-citizen perceive future energy policies. *Energy Research & Social Science*, *35*, 152–162. https://doi.org/10.1016/j.erss.2017.10.021

EEA. (2019). *The European environment – state and outlook 2020: Knowledge for transition to a sustainable Europe*. https://www.eea.europa.eu/publications/soer-2020/at_download/file

Ellsworth-Krebs, K. (2020). Implications of declining household sizes and expectations of home comfort for domestic energy demand. *Nature Energy*, *5*(1), 20–25. https://doi.org/10.1038/s41560-019-0512-1

Fischer, C., & Grieshammer, R. (2013). *When less is more: Sufficiency: Terminology, rationale and potentials*. https://www.oeko.de/publikationen/p-details/when-less-is-more-sufficiency-terminology-rationale-and-potentials

Hirth, S., Kreinin, H., Fuchs, D., Blossey, N., Mamut, P., Philipp, J., & Radovan, I. (2023). Barriers and enablers of 1.5° lifestyles: Shallow and deep structural factors shaping the potential for sustainable consumption. *Frontiers in Sustainability*, *4*, Article 1014662. https://doi.org/10.3389/frsus.2023.1014662

Huber, R. A., & Wicki, M. (2021). What explains citizen support for transport policy? the roles of policy design, trust in government and proximity among Swiss citizens. *Energy Research & Social Science*, *75*. https://doi.org/10.1016/j.erss.2021.101973

Jungell-Michelsson, J., & Heikkurinen, P. (2022). Sufficiency: A systematic literature review. *Ecological Economics*, *195*, 107380. https://doi.org/10.1016/j.ecolecon.2022.107380

Kyselá, E., Ščasný, M., & Zvěřinová, I. (2019). Attitudes toward climate change mitigation policies: a review of measures and a construct of policy attitudes. *Climate Policy*, *19*(7), 878–892. https://doi.org/10.1080/14693062.2019.1611534

Lage, J., Thema, J., Zell-Ziegler, C., Best, B., Cordroch, L., & Wiese, F. (2023). Citizens call for sufficiency and regulation — A comparison of European citizen assemblies and National Energy and Climate Plans. *Energy Research & Social Science*, *104*, 103254. https://doi.org/10.1016/j.erss.2023.103254

Lorek, S., & Spangenberg, J. H. (2019). Energy sufficiency through social innovation in housing. *Energy Policy*, *126*, 287–294. https://doi.org/10.1016/j.enpol.2018.11.026

Oltra, C., Sala, R., López-Asensio, S., & Germán, S. (2023). Public acceptability of policies to reduce urban air pollution: A population-based survey experiment. *Revista Española De Sociología*, *32*(4), a195. https://doi.org/10.22325/fes/res.2023.195

Sandberg, M. (2018). Downsizing of Housing. *Journal of Macromarketing*, *38*(2), 154–167. https://doi.org/10.1177/0276146717748355

Schnepf, J., Christmann, U., & Groeben, N. (2023). Housing Policy Reframed? How Conceptual Framing Affects Support for Social Housing Policies in Germany. *German Politics*, *32*(2), 381–402. https://doi.org/10.1080/09644008.2021.1941897

Tröger, J., Toulouse, E., Alexander-Haw, A., Dütschke, E., Marignac, Y., Preuß, S., & Toledano, A. (2022). *Refinement of research design* (FULFILL Deliverable No. 2.3). https://fulfill-sufficiency.eu/wp-content/uploads/2022/08/FULFILL_Research_Design_202208_submitted.pdf

Appendix

The following table presents the covariates that were used in the regression models.

Table 4 Overview of dependent variable and covariates

	Variable	Description or question asked to respondents	Coding
Dependent variable			
Evaluation of the policy	*(a) Evaluation of the ban and (b) Evaluation of the fee*	Based on the following items measuring the evaluation of the (a) ban or (b) fee an index was created by adding up all values for the seven evaluation items and dividing them by the sum of the items. All items were measured on a five-point Likert scale ranging from 1: Strongly oppose/ Very negatively/ Strongly disagree to 5: Strongly support/ Very positively/ Strongly agree (1) Do you support or oppose this policy measure? (2) Would this policy measure affect you positively or negatively? (3) In how far do you agree with the following statement: "From a societal viewpoint this policy measure is fair"? Do you think the policy is effective in regard to the following aspects: The policy is effective in … (4) … reducing the CO_2- footprint. The CO_2 footprint indicates how many CO_2 emissions are emitted by a specific lifestyle and the associated activities. (5) … reducing housing shortages. (6) … ensuring housing is more affordable. (7) … improving well-being for the society.	Index ranging from 1 (negative overall evaluation) to 5 (positive overall evaluation)

2 That is, a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child (cf. https://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf).

Covariates			
Sociodemographic characteristics	*Income per person (in 1T€)*	Net annual income of respondents household divided by household size using OECD weights[2]	In 1000€
	Working	*Which of the following categories describes your cur-rent situation best?*	1: Full-time employed/ Part-time employed/ Self-employed 0: In training/ education/ House wife / house husband/ Looking for work / currently unemployed/ retired/ Other/ Prefer not to answer
	Higher education	*What is the highest level of education that you have completed?*	1: Vocational/ technical training or education or Academic degree (Bachelor and Master degree or PhD) 0: No school completed/ Primary education/ Secondary education (college, high school, middle school)
	Female (vs. male)		1: Female 0: Male
	Age		Metric, between 1 and 92
	City (vs. rural)	Degree of urbanisation of the region the respondent lives in[3]	1: Cities 0: Towns and suburban/ rural
Attitudes towards political system	*Trust national politicians*	*In how far do you trust the following groups and institutions in [country of respondent]? National politicians (members of parliament, ministers etc.)*	1: fully distrust 2: tend not to trust 3: undecided 4: tend to trust 5: fully trust
	Say in what government does	*From your point of view: In general, to what extent does the political system in [country of respondent] give people like you a say in what the government does?*	1: not at all 2: a little 3: a moderate amount 4: a large amount 5: an extreme amount

3 The urbanization is determined using the postcode, postcode to NUTS tables (https://gisco-services.ec.europa.eu/tercet/flat-files) and urbanisation data from Eurostat (https://gisco-services.ec.europa.eu/tercet/Various/PC_DGURBA_2018.zip).

Political orientation	*Support national policies*	*I identify with nationally oriented policies.*	1: Strongly disagree 2: Disagree 3: Neither disagree nor agree 4: Agree 5: Strongly agree
	Support social policies	*I identify with socially oriented policies.*	1: Strongly disagree 2: Disagree 3: Neither disagree nor agree 4: Agree 5: Strongly agree
	Support conservative policies	*I identify with conservative oriented policies.*	1: Strongly disagree 2: Disagree 3: Neither disagree nor agree 4: Agree 5: Strongly agree
	Support liberal policies	*I identify with liberally oriented policies.*	1: Strongly disagree 2: Disagree 3: Neither disagree nor agree 4: Agree 5: Strongly agree
	Support environmental policies	*I identify with environmentally oriented policies.*	1: Strongly disagree 2: Disagree 3: Neither disagree nor agree 4: Agree 5: Strongly agree
Environmental identity		An index was created based on the following two items. Respondents were asked to indicate in how far they agree with the statements on a five-point Likert scale ranging from 1: Strongly disagree to 5: Strongly agree. For the index the sum of the two items was divided by 2 and subsequently the index was z-standardised. *I think of myself as an environmentally-friendly consumer.* *I think of myself as someone who is very concerned with environmental issues*	Index ranging from -3.03 to 1.80

Problem aware-ness sustaiable housing	*Problem awareness sustainable housing*	*In how far do you think that the provision of sufficient sustainable housing is a serious problem?*	1: no serious problem at all 2: rather not a serious problem 3: undecided 4: rather a serious problem 5: a very serious problem
Familiarity with the policy measures	*Heard of ban/ fee*	*Have you heard about this policy measure before this survey?*	1: yes, but I didn't really know what it is / yes, and I know what it is] 0: No, I have never heard of it
Framing experiment	*Framing: Overcome (vs. punish)*	Overcome condition: *The aim of this policy is to overcome unsustainable housing choices.* Punish condition: *The aim of this policy is to punish unsustainable housing choices.*	1: the respondent saw the overcome condition 0: the respondents saw the punish condition
Personal affectedness by the policy measure	*Preference single-family home*	*Regardless of whether you currently live in that type or not: What type of housing do you like most?*	1: A detached house (free-standing with 1-2 dwellings) 0: A terraced house (1-2 dwellings as double house, row house, or other)/ A multi-family house (3-12 dwellings)/ An apartment block (13 or more dwellings)/ Other
	Living space	Based on the answers of the following question a dummy variable was created. First, the household size was divided by the number of household members. In a next step, the means of the living space per country were calculated to obtain the average living space in our sample for each country. *What size is the living space of your dwelling in 2022 in m²? Please, estimate if you are not sure.*	1: Having above average living space per person 0: Having an average or smaller living space.