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Abstract

In light of the increasing climate change, policy makers have set ambitious targets for greenhouse gas emission. To achieve these targets, it is necessary to speed up the installation of renewable wind and solar power plants. This dynamic calls for an accelerated planning and permitting process with low resistance from citizens. To ensure a high acceptance of the energy transition, it is important to understand which design elements or characteristics, objectives or impacts of the energy transition are more or less preferred by citizens. This study therefore investigates what the preferred design elements for a fair and secure energy transition of German households look like. Based on literature and Energy Union objectives and policies, key dimensions are identified and then described by design elements. The dimensions are: the form of burden sharing of energy transition costs (distributional aspects), actions with respect to investment in and consumption of energy, the origin and security of energy supply and policies for a sustainable energy transition. To identify the favoured design elements, we applied a conjoint analysis. In an online survey conducted among 2000 German citizens, the respondents were asked to choose between two designs of the energy transition that are described by a design element per dimension. The results show that German households favour the polluter-pays rule for burden sharing, a regional energy supply to ensure supply security, information and appeals as policy instruments to promote the energy transition. Regarding actions, households opt for installing private photovoltaics. At the level of dimensions, the approval and refusal of the suggested burden sharing mechanisms were larger than those of the suggested energy supply design elements.

Key words: design elements; energy transition; preferences; burden sharing; energy security; investor

Contents

1 Introduction

The climate crisis and the corresponding energy transition (ET) are huge tasks challenging governments and societies around the world. The transformation of the energy system towards sustainable energy use does not come without costs. The European Commission and national governments decided to apply carbon prices as well as push investments in renewable energies and energy efficiency. This leads to increasing cost burdens, which are directly or indirectly shouldered by the citizens. The war in Ukraine is making the ET even more urgent, calling for an acceleration of the transition, because Germany and other European countries depend on Russia's energy sources (Ekardt, 2022). Consequently, politicians of EU member states are trying to find ways to replace gas and oil, which used to be imported from Russia (Niemann, 2022). Rising energy prices due to scarcity of natural gas have quickly become a direct burden for citizens with low incomes (Tagesschau, 2022c). Moreover, energy-intensive companies affected by the consequences of the Ukraine crisis also suffered from high energy prices (Tagesschau, 2022b).

Against this background, it becomes clear that rising expenditures as part of the energy transition entail also social, financial and economic concerns and impacts. This raises questions on the overall design of the energy transition, i.e. which design elements of the energy transition should be selected to achieve an acceptable trade-off between financial, social and economic aspects while striving for the mitigation of climate change at the same time. To answer this, we reviewed documents discussing the elements of a transformation of the energy system towards a sustainable system as well as the objectives and policies of the EU Energy Union. Based on this review, we identified key dimensions of the EU energy transition. The dimensions include the form of burden sharing of energy transition costs (distributional aspects), actions with respect to investment in and consumption of energy, the origin and security of energy supply and policies for a sustainable energy transition. These key dimensions can be described by design elements. They are understood as a bundle of different mechanisms, rules, actions or measures that affect the perception and implementation of the energy transition. They address issues such as cost distribution and justice, strategies and policies, security aspects and actors of the energy transition.

A previous study of Breitschopf and Burghard (2023) revealed the importance of the dimensions *energy security* and *actions* from the perspective of citizens for the implementation of the energy transition. It also highlighted that preferences for selected design elements are contingent on financial participation, but it failed to show the trade-off between design elements of one dimension and other design elements of another dimension. For example, is energy security based on regional energy supply more important than support of energy poor (burden sharing)? A few papers were found addressing preferences for policies such as the preference for support policies for renewable energies versus phasing out of fossil fuels (Kanberger and Ziegler 2023), or preferences for using energy-efficient appliances versus behavioural changes (reduced or shifted electricity consumption) (Zawadzki et al. 2022). In addition, papers investigating burden sharing rules found that the polluter-pays rule received the highest approval (Fanghella et al. 2023). This study addresses this research issue as well and examines the following research question: *"Which dimensions and design elements for a sustainable, fair and secure energy supply do German households prefer?"* To answer this question, we conducted an online survey among German citizens. We used conjoint analysis to identify the favoured design elements.

Section 2 gives an outline of the conceptual framework including the research design. Section 3 provides information on methods for data collection and data analysis as well as the design of the questionnaire. The next section describes the results of the data analysis, which we discuss in Section 5. This section also summarises the main findings of the study and gives policy recommendations and suggestions for further research.

2 Conceptual approach

2.1 Dimensions of the energy transition and design characteristics

The selected dimensions of the energy transition rely on preceding works of Breitschopf and Burghard (2023). The dimensions build on the EU Energy Unions key objectives and dimension of a sustainable, affordable, secure and efficient energy supply (European Commission 2022b, 2022a, 2021).

Against the background of the energy crisis, we have taken into account the increasing importance of energy security and adopted the understanding of energy security stated by Sovacool and Brown (2010). They subsume under the notion energy security a broad set of criteria: availability, affordability, economic and energy efficiency, and environmental stewardship. In this sense, *availability* is translated into a secure energy supply that manifests through energy import (from countries outside the EU), the establishment of an EU internal energy market (European Commission 2015), the focus of a decentralised and distributed energy supply and autonomy through energy self-consumption (Breitschopf and Burghard 2023). The criteria *efficiency* (Sovacool and Brown 2010) refers to improving performance in technical and behavioural areas. We call this dimension *action* and subsume different options on how households achieve or contribute to an efficient transformation of the energy system towards a secure and sustainable system. This encompasses households' energy consumption, e.g. flexible use of energy or energy savings, and households' monetary investments in energy efficiency or renewables or energy cooperatives, or in non-monetary terms in political participation as outlined in Sonnberger and Ruddat (2016). With respect to the term *affordability*, we subsume distributional and fairness aspects. There exist different perspectives of a fair burden sharing that are based on studies by Groh and Ziegler (2018) and Pahle et al. (2021). These comprise i) polluter-pays-rule where every household should contribute to the ET according to its energy consumption. Consequently, for this rule, households with a high energy consumption bear a higher share of the costs. This is considered as fair because those who are responsible for causing costs or damages are sanctioned accordingly; ii) ability-to-pay-rule, under which every household should contribute to the ET according to its financial capital. Following this rule, households with a high income bear a higher share of the costs. This is based on the principle to help the poorest first and includes social assistance by the state; iii) equal-pay-rule calls for sharing the costs equally across all households. The idea is that everyone is equally obliged or authorised as e.g. in elections where all citizens have equal votes; iv) energy-intensive-exemptions implies that companies that are exposed to enormous energy costs due to their energy intensive production are partly exempted from additional energy costs caused by the energy transition such as taxes or levies. *Environmental stewardship* relates to efforts regarding environmental protection and mitigation of climate change. Stewards are predominantly governments at the national and EU level. The responses promoting a sustainable energy transition comprise a mix of different policies such as long-term strategies and targets, regulations and policy instruments including financial (dis)incentives (Cárdenas Rodríguez et al. 2015; Kitzing et al. 2012; UBA 2020; European Commission 2022b). As applied in Breitschopf and Burghard (2023), we rely on the taxonomy of policy instruments according to Bemelmans-Videc et al. (2006), and distinguish between regulations, prohibitions, information and (dis)incentives. The selected dimensions and their characteristics are depicted in Table 1.

Table 1: Selected dimensions and design characteristics of the energy transition

Attributes (dimensions)	**Attribute characteristics** (design characteristics, levels)	**Description**
Energy supply security (dependency and reliability)	• Global energy imports • Internal EU market • Local energy generation Prosumption	• Energy import from countries outside the EU • EU-wide energy supply, i.e. internal EU energy market • Regional energy supply through local generation of electricity • Private energy supply through own electricity generation
Burden sharing of ET costs (distributional aspects)	• Equal-pay rule • Polluter-pays rule • Ability-to-pay rule • Competitiveness pay rule	• Per capita • Per energy consumption • Consideration of low-income, other energy consumers pay a bit more • Consideration of energy-intensive industry, other energy consumers pay a bit more
Actions (behavioural aspects or decisions)	• Investment in RE • Investment in energy cooperatives • Investment in energy efficiency • Reduced energy consumption • Flexible energy consumption • Investment in political participation	• Investment in a private photovoltaics plant (roof top or balcony solar module) • Investment in energy cooperative • Investment of households in end devices of A++, e.g. freezer, refrigerator • Energy-saving behaviour • Flexible energy consumption according to availability of renewable electricity • Investment in terms of time (non-monetary) in political processes, participation in processes
Policy instruments	• Regulation • Prohibition • Appeals and information • Financial disincentives	• Standards of GHG emissions, energy efficiency • Prohibition (of technologies with) fossil fuels • Information on energy savings and RE use • Disincentive to consume fossil fuels through higher prices

2.2 Capturing of costs or benefits of the energy transition?

Wind parks are characterised by a high visibility and, when located close to residential buildings, they often lead to controversial debates among citizens in the affected region (Wüstenhagen et al. 2007). Therefore, the accepted proximity of a wind park to a citizen's home was applied as a trade-off that respondents are willing to make in order to retain potentially other characteristics of the product "energy transition". An advantage of choosing the vicinity to a wind park is that it affects individuals regardless of their income level or socio-demographic factors.

Moreover, we decided to also measure the willingness to pay for the energy transition (WTP) of the respondents by using implicit prices that reflect the trade-off respondents are willing to pay to retain another particular characteristics of the energy transition. One argument against measuring WTP is that, methodologically, the measurement of WTP is sometimes subject to very high uncertainties, as the usual measurement methods do not consider competition or the ability to opt out, and usually lead to inflated estimates of WTP (Sonnberger and Ruddat 2016). The use of the competitive market simulation approach within the Sawtooth software solves the problem of inflated estimates of WTP by taking realistic competition into account when measuring WTP (Orme 2021).

Therefore, to capture indirectly perceived monetary and non-monetary benefits or costs of the energy transition, we included two additional variables: the vicinity to wind parks (VWP) and the

WTP. They reflect the "price" accepted by respondents in terms of distance or monetary contribution for receiving their preferred design elements of the energy transition (see Table 2).

Table 2: Additional variables to capture monetary and non-monetary aspects

Additional variables	Characteristics
Vicinity to wind park (VWP): *How many meters should the closest wind farm be at least to your home?* (Langer et al. 2017)	500 meters 1000 meters 5000 meters
Willingness to pay for the ET (WTP): *To support the ET, I pay a monthly amount of …* (Lienhoop 2018)	+ €2.50 + €5.00 + €10.00 + €15.00

3 Data and methods

3.1 Choice sets and survey design

The design of the choices for the survey comprises two options, also called stimuli (S), which result from the combination of all attribute levels according to the formula S = M1 * M2 * . . . * Mj, where M represents the number of levels (characteristics) per attribute j (Backhaus et al. 2021). Applied to our attributes and their levels we got S= 4.608. These were far too many stimuli to be included in a survey. Hence, we used a reduced design set that represented a subset of the complete designs. This reduction is in line with the recommendation of using the Sawtooth software (Sawtooth 2017). In order to avoid overstraining of the respondents, we set the number of attributes to six (four dimensions and two proxies – vicinity and WTP) and that of attribute levels to six at maximum (Perrey 1998).

To reduce the choice set, we selected the balanced overlap method as it presents each respondent a different design of choice sets to avoid order effects. The Sawtooth Software statistics was applied to test whether the number of choice sets is methodologically meaningful or not and if reported standard errors were below 0.05. Subsequently, 300 different choice sets were offered. An example is given in Annex A.1.2.

The questionnaire starts with an introduction to make the respondents familiar with the topic and the structure of the questionnaire. A comprehension question was included at the beginning of the survey to ensure thorough reading and understanding of the questions. If the respondent failed to answer this question, he/she was excluded from the survey. Questions regarding socio-economic or demographic aspects were included (gender, age, educational degree, occupation, federal state, housing situation, household size and net income) as well. To get an idea on the respondents' involvement with wind power, they were asked to indicate the distance from their home to the nearest wind park. To ensure the respondents understand what they are supposed to do, the choice situation was explained, and finally, the choice sets were presented. The questionnaire is available in Annex A.1.2. It took the respondents in average 7 minutes to answer the questionnaire.

3.2 Data collection

The online survey was conducted in August 2022, in cooperation with a service provider for online polls. 7232 households opened the online questionnaire, 2027 households matched the quota and answered the qualifying questions correctly. The final data set comprised 2011 participants who completely answered all questions. We applied a quota sampling based on age, sex, household size, qualification and employment. The quotas (see Annex A.1.1) are thought to reflect the respective situation of the population in Germany in terms of sex, education level, household size, occupation, and age. For the socio-demographic questions regarding federal state, housing situation and net income, no quota was implemented. The socio-demographic attributes and their levels are depicted in Annex A.3.1. The shares by federal state are nearly representative, while those for housing situation and monthly net income are not representative (see Figure 4 in Annex A.3.1, and Annex 0). Given the overall achievement of the quota, we classified the sample as highly comparable to the population of Germany.

To conduct the analysis, we decided for Sawtooth software, as it has the advantage of data evaluation and hosting of the questionnaire. Thus, the questionnaire was programmed with Sawtooth software and forwarded as a link to the service provider. Before the survey went into the field, a pre-test was carried out with n = 200 with the aim of testing the function of the implemented quotas in the questionnaire and checking the comprehensibility of the questions.

3.3 Analytical methods

3.3.1 Conjoint-analysis

The conjoint analysis (CA), a type of experimental design approach, is mainly used in marketing, e.g. for product development (Langer, Decker, & Menrad, 2017) with the aim to determine consumer preferences for a product in order to realise high sales of the product. Key product characteristics might be equally ranked by consumers when they were asked (Fiedler et al. 2017) and it remains unclear which feature is preferred to another. In a CA, a bundle of features, and not individual characteristics, are queried for evaluation. In this way, a CA makes it possible to determine preferences without asking respondents about them directly. Such an indirect query of partial values does not cognitively overstrain the respondents (Homburg, 2017). The CA is based on the idea that the total utility of a product is made up of the partial utility of individual features of the product (Backhaus et al. 2016). This is in line with Lancaster's characteristics theory of value (Lancaster 1966), stating that consumers do not derive satisfaction from the good itself but from the sum of its individual characteristics (Herrmann et al. 2003).

Although CA is predominantly used in product development and marketing research (Homburg 2017; Langer et al. 2017), using CA to investigate preferences for energy policies is also supported by the literature. For example, CA has been used among others to study preferences related to wind energy installations (Dimitropoulos and Kontoleon 2009; Langer et al. 2017; Fraune et al. 2019; Lienhoop 2018), to markets (Aruga et al. 2021; Knoefel et al. 2018), and WTP for the ET (Andor et al. 2018; Menyeh 2021; Pepermans 2011; Pons-Seres de Brauwer and Cohen 2020).

For this study, we decided to use the "choice-based conjoint analysis" (CBCA) to make citizens select their preferred designs (dimension as attribute and design elements as attribute levels) of the energy transition. In a CBCA, respondents indicate their preference by selecting their preferred products in multiple choice situations (Backhaus et al. 2021). We determined attributes and their level. The attribute levels should be able to be influenced in reality (in this case, by political decision-makers), while the attributes should be realistic, relevant, and easily understood by the average respondent (Homburg 2017). In CA, attributes are usually limited to about five to eight, each with up to six characteristics (Perrey 1998). In our study, the attributes correspond to the dimensions of the energy transition while the attribute levels are equivalent to the design and sometimes also called characteristics. Like in a CBCA, in which respondents indicate their preference by selecting their preferred products in multiple choice situations (Backhaus, Erichson, Gensler, Weiber & Weiber, 2021), we asked the respondents to choose between two designs of the energy transition as exemplified in Annex A.1.2.

We chose the Hierarchical Bayesian model (HB model) for its advantage of estimating utility values at the individual level of all respondents. Calculating individual utility values of a CBCA is challenging because a CBCA is based on a small number of choice sets (in our case six choice sets). However, the application of the HB method uses the information from all respondents (Sawtooth Software, 2022) to estimate the results for each individual based on probability calculation (Howell, 2009). This means the Sawtooth software applies an algorithm that estimates individual scores by “borrowing” information from other respondents to stabilise the estimates (Orme 2000). Since each update of individual utilities requires an update of the whole sample average (Howell, 2009), the HB does a series of iterations for each update.

HB uses all respondents’ data to produce estimates for each participant. This information “borrowing” gives HB the chance to generate reasonable estimates for each participant, even though the amount of data available for each respondent may not be sufficient for individual analysis (Johnson 2000). The recommendation to accumulate draws over 10,000 iterations for the development of the point estimates (Sawtooth Software, 2021a) was pursued. The estimated utility values can be positive and negative. A negative utility value means that participants like the characteristic less in relation to the other characteristics (Sawtooth Software, 2022f). It is to note that the absolute utility values should only be compared within the individual characteristics (Sawtooth Software, 2022f).

The HB-model assesses utility scores at the individual level. For this analysis, a utility report is developed for the socio-demographic sub-groups, which provides insight into the total and partial utility values and attribute importance according to socio-demographic factors, which form a mean value. This mean value is used to check whether differences exist between the individual groups.

3.3.2 Group comparison tests

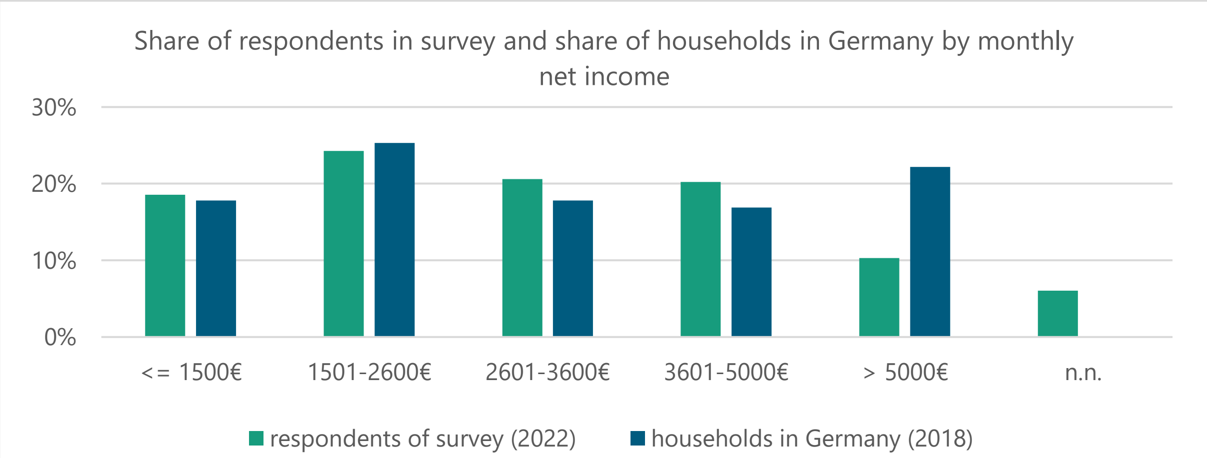
We expected socio-demographic characteristics to have an impact on respondents' preferences. We formed different groups based on the socio-economic characteristics. The groups should be independent from each other and not interrelated (Kühnel and Krebs 2012). The mean of partial utilities of each design element was calculated for the whole sample. Then we compared these means to the means of sub-samples based on socio-demographic characteristics. A one-sample t-test was applied to test whether the two means are from the same or from a different sub-sample. In the case of nominal variables, we used the chi^2 test; for variables of non-nominal nature and not meeting the precondition of parametric t-tests of difference (normal distribution, equal variances between the two groups), we applied the non-parametric Mann-Whitney U test (Nachar 2008), or in the case of more than two groups, the Kruskal-Wallis test (Wollschläger 2020). They test whether the groups or samples stem from the same population, regardless of distribution and equal variances. To depict the effect size, we used Cohen's d (Cohen 1988) of Cramér's V (Cramér 1974). The significance of differences was tested using the chi^2-test, one-sample t-test or U-test of the software Stata. The results revealed whether certain groups attached higher or lower importance to certain attributes.

4 Results

4.1 Descriptive statistics

The sample is not representative but highly comparable to the population in Germany as regards socio-demographic characteristics such as sex, age, education, employment, household size (see Annex A.1.1 and A.3.1). Regarding income, the sample tends to include a slightly higher share of low and medium income groups (see Figure 1) than the population in Germany, and with respect to the regional distribution of the respondents, larger federal states tend to be slightly underrepresented (see Figure 4 in Annex A.3.1 and Annex 0).

Figure 1: Income of respondents of survey and all households in Germany



Source: own data and own calculation based on Bundeszentrale für politische Bildung 2020, Destatis EVS 2018. Note: n=2011

Table 3 depicts the mean of the scores of the partial utilities for each design element, standard deviations, as well as minimum and maximum values. Negative mean values indicate a preference below the respective mean of the design element, a positive value a preference above the mean. We found that especially for low utilities scores such as EU imports, prosumption, financial (dis)incentives, and distance of a wind farm of 1000 meters and 5 km, the standard deviation is high compared to the mean, while the standard deviation is lower than the mean for competitiveness-pay-rule, polluter-pays rule, global imports and WTP of 15 euros. The latter signals that there is a rather homogenous agreement and preference for the respective design element among the respondents, while a high ratio reveals a high dispersion, i.e. rather heterogeneous preferences for this element.

Table 3: Mean and standard deviation of utility scores per design elements (attribute levels)

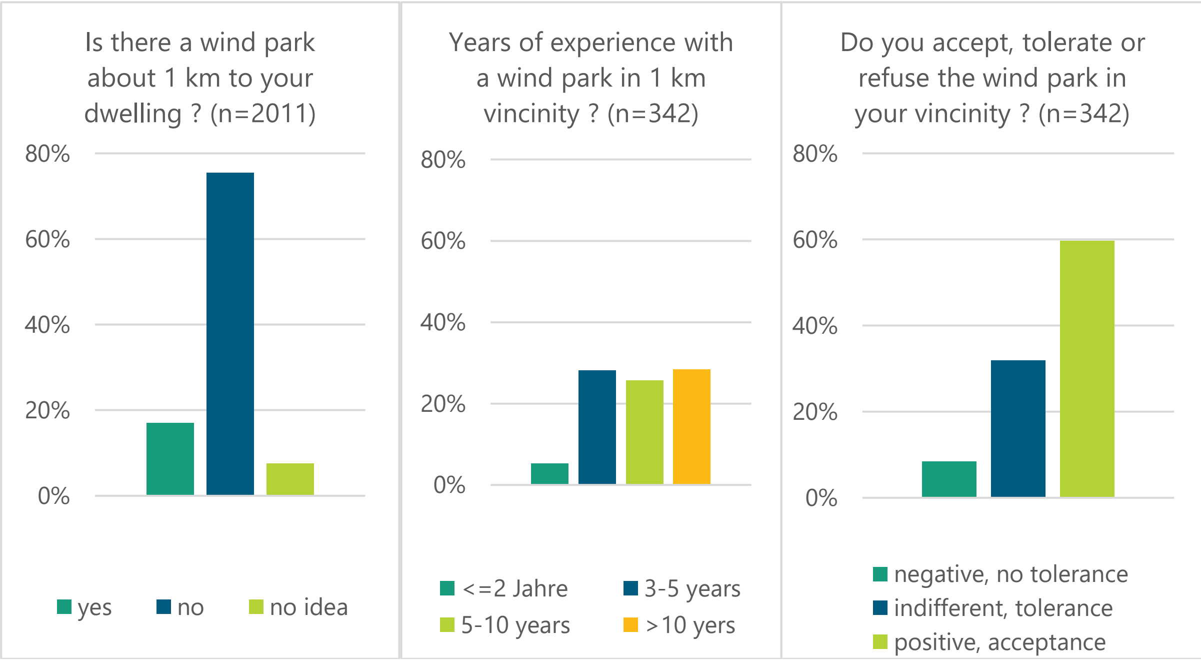
Variable	Mean	Std.dev.	Min	Max
equal_pay	-16.47	23.20	-0.10	54.83
polluter_pay	40.57	35.57	-92.88	157.25
ability_pay	33.48	36.05	-80.48	152.56
competitiveness_pay	-57.58	42.91	-183.80	98.31
private_investment	22.01	29.61	-83.84	11.83
cooperatives	-13.05	25.68	-107.25	72.05
efficiency	9.20	26.21	-97.99	96.41

Variable	Mean	Std.dev.	Min	Max
savings	16.74	24.10	-52.80	157.29
flexible	-19.83	22.10	-99.92	58.39
political	-15.07	21.62	-99.10	54.34
global_imports	-27.08	22.30	-110.95	61.08
EU_import	3.39	18.75	-68.93	83.78
local_generation	19.85	20.68	-7.43	108.63
prosumption	3.85	19.90	-61.71	69.91
regulation	17.11	21.43	-69.11	84.07
prohibition	-39.57	46.09	-168.83	132.33
information	27.04	30.37	-66.67	129.34
financial	-4.57	23.00	-88.63	67.02
meter500	-11.65	42.01	-145.43	134.65
meter1000	2.92	20.69	-76.81	74.95
km_5	8.73	41.01	-114.27	148.33
Euro_2_5	60.49	68.23	-159.22	200.60
Euro_5	29.94	29.46	-81.92	92.30
Euro_10	-15.04	25.58	-80.30	83.50
Euro_15	-75.39	69.68	-0.23	150.51

Source: own data and own calculation. Note: n=2011

With regards to the inquiry concerning the presence of a wind power plant approximately 1 km away from their residence, we obtained the subsequent responses: about 17% of the respondents live in about 1 km distance to a wind park, while 8% had no idea whether there is a wind park in their vicinity). Many of these respondents replying with "yes" (54%) had lived for more than 5 years in close vicinity to the wind park (13% could not answer how long they had lived in close vicinity). We found that only a minority of these respondents (8%) perceived this vicinity as negative and were not willing to tolerate it, while a majority of 60% revealed a rather positive attitude towards wind parks in their vicinity (see Figure 2).

Figure 2: Vicinity to wind parks and acceptance



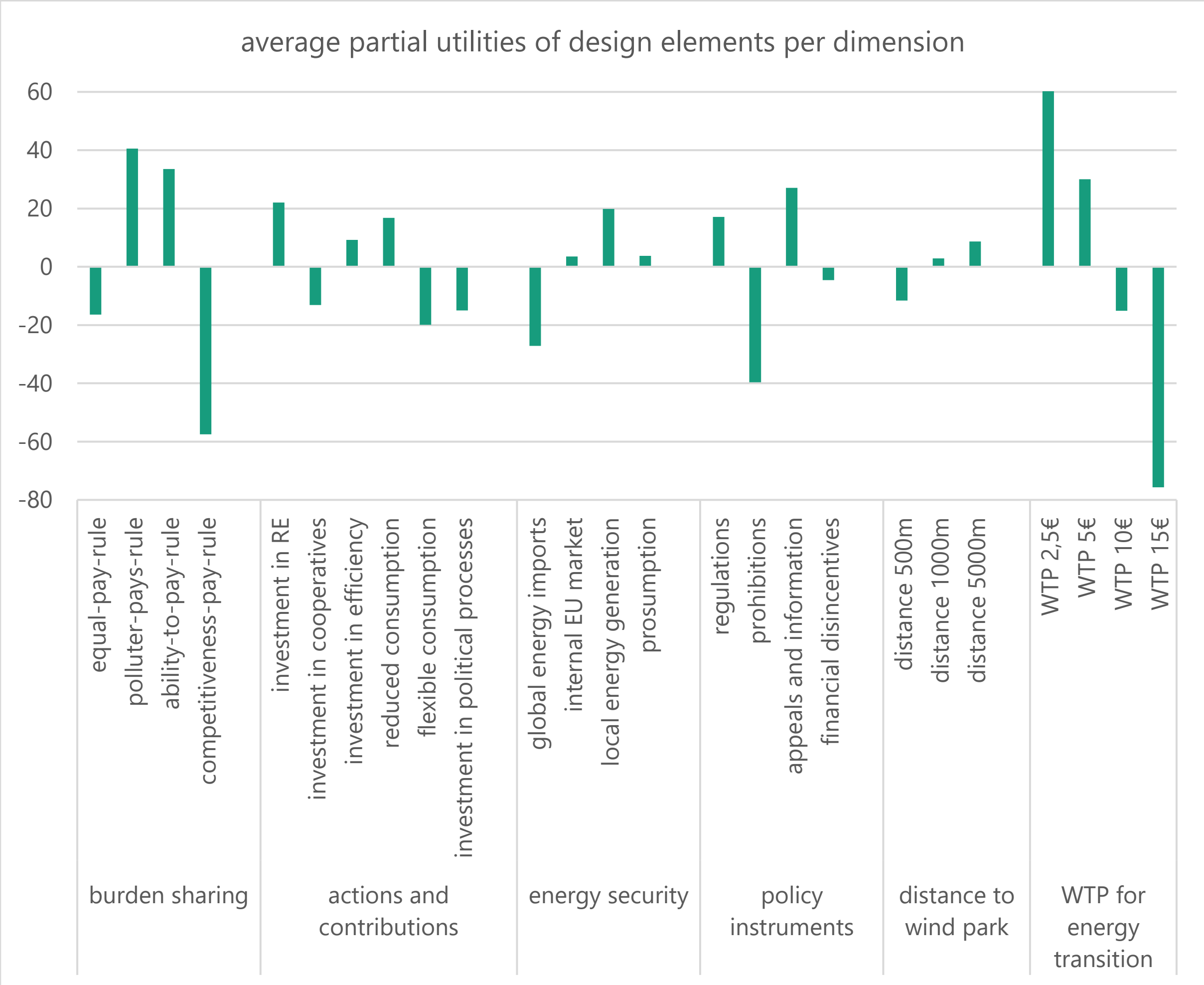
Source: own calculation

The acceptance of wind parks by those respondents that live in close vicinity is not linked to the number of years they have lived in close vicinity (experience with wind parks). Moreover, we neither found a link between acceptance and age, sex, household size, employment nor federal states. However, the analysis of group differences based on a chi^2--test displayed a significant difference in acceptance by income classes (p = .002), education (p = .016) and dwelling (p = .003) of small to medium size (Cramer's V). House owners refused vicinity to wind parks more than those respondents living in a rented flat. Similarly, respondents with a higher education level and income revealed a significantly lower acceptance of nearby wind parks. We assumed that all three socio-demographic variables are related to each other, i.e. higher education is likely to result in higher net income, and this, in turn, in ownership of real estate. However, we could not find a significant correlation between education and income.

4.2 Utilities and importance of design elements and dimensions

The average partial utility of each design element is illustrated for the sample (n = 2011) in Figure 3. The estimated utilities are highly significant (see Annex 0), evident from the p-values (p < .01) derived from the Count method, the confidence intervals calculated using the HB method (Sawtooth Software, 2022e) and the t-test assessing the model's fit (Glen 2022). Elaborated data can be found in Annex 0.

Figure 3: Average partial utilities of design elements of the energy transition by dimensions



Source: own data and own calculation. Note: n=2027

Comparing the utilities across the dimensions, the analysis revealed the most pronounced differences in preferences for WTP and burden sharing, indicating a significant emphasis on these two aspects. Within the dimension of burden sharing, burden sharing on the basis of energy consumption (*polluter-pays rule*) showed the highest utility value, followed by *the ability-to-pay-rule* and *equal-pay rule*. The *competitiveness-pay-rule* to support industry showed the lowest utility value for the respondents.

Looking at the dimension actions to support the ET, we found that the utility score for private PV is the highest (*investment in RE*). Respondents also assigned a high utility value to energy-efficient end devices and energy-saving behaviour. In contrast, energy cooperatives and political processes as well as flexibility in energy consumption were considered of low partial utility.

Within the dimension energy security, the highest preference was assigned to *local energy supply*. Contrarily, the lowest preference was assigned to *global energy imports*. The design elements *EU-imports (*EU-wide energy supply) and *prosumption* (private energy supply) received approximately the same utility score.

Within the dimension policy instruments, the design element *information* had the highest utility score, followed by *regulations* and *higher prices*. The lowest utility score was assigned to *prohibitions*.

Regarding the attribute distance to a wind park, the results mirror the expected trend: a higher distance leads to a higher utility value for the respondents. A clear trend can also be seen in the attribute *WTP* with regard to financial contribution to the energy transition in terms of €/kWh: As the cost increases, the utility score decreases.

Looking at the utility that the respondents allocated to the dimensions or proxy variables WTP and distance to WP (see Annex A.3.4), we found that in average the respondents considered WTP to be the most important dimension. In addition, a high relevance was attributed to the burden sharing of ET costs. In contrast, secure energy supply and vicinity to wind parks were attributed the lowest importance. Neither important nor unimportant to the households were policy instruments and actions for the ET. However, it is to note that the importance was based on the divergence of the partial utilities from zero (mean). The more opposite or contrasting the design elements within one dimension were, the more likely a high deviation from the mean (zero) was. The closer or more similar design elements were with respect to the key dimension, the closer were the partial utilities to the mean (zero), and thus, the more indifferent were respondents regarding these elements within one dimension. This effect is enforced by the dependency of the choice on other designs of dimensions. Summarising, within a dimension, the importance implicitly depended on the contrast of the design elements. Between dimensions, contrasting design elements within one dimension relativised the importance of other dimensions.

4.3 Socio-demographic characteristics and preferences for design elements

Since living conditions might have an impact on the preferred choice set, we investigated which socio-demographic factors are related to what extent to preferred design elements. For this purpose, we first tested for group differences in partial utilities by socio-demographic characteristics. The partial utilities were measured in terms of utility scores and reflect preferences, i.e. we obtained a ranking of the utility of design elements within each dimension for each socio-demographic sub-group. If we found significant differences between sub-samples, we then compared the mean utility scores or values for each design element of the sample to the means of the sub-samples. The sub-samples were created according to socio-demographic characteristics. Thus, we tested whether the partial utilities of the design elements significantly differ by the socio-economic or demographic characteristics such as age, education, occupation, federal state and whether this results in a different order of preferences (sizes of sub-samples see Table 4 in Annex A.3.1. We found some significant differences:

- Age:
  - Burden sharing: Differences in utility scores between age groups were significant for the polluter-pays rule ($p = .0232$) and competitiveness-pay-rule ($p = .0146$) but no tendency in preferences between the younger or older age groups was detected. The order of the utilities of the design elements, i.e. the preferences, were the same across all groups.
  - Actions: significant differences in utility scores were found for **energy cooperatives** ($p = .0117$, and participation in **political processes** ($p = .0179$) but the ranking of design elements within this dimension is for each age group the same. However, the age group 18-29 years revealed the least preference for political participation, and rated cooperatives more positively than all other age groups with respect to their potential contribution to the energy transition (significantly different to mean utility score with $p = .0017$ and $p = .0012$, respectively).
  - Energy security: significant differences in utility scores were found for **prosumption** between the age groups ($p = .0231$). The age groups 30-39 and 60-69 years ranked prosumption as the least beneficial design. Among the age groups the 18-29 year olds assigned the highest utility score to prosumption ($p = .0059$), but they still ranked it in third place among of the design elements in this dimension.

    - Willingness to pay for the energy transition differed between age groups (p = .0002). The older respondents revealed a stronger preference for low costs than the younger age groups.

- Education:

    - Burden sharing: respondents revealed different partial utilities for the burden sharing types equal-pay-rule (p = .0777), **ability-to-pay-rule** (p = .0101) and **competitiveness-pay-rule** (p = .0351). Mainly those with a high school degree, i.e. a baccalaureate, but no university degree revealed the highest (ability-to-pay) and lowest (competitiveness-pay-rule) utility scores.
    - Actions: the design elements participation in **political processes** (p=.0013) and **energy cooperatives** (p = .0195) displayed different utility scores by education levels. Those respondents with higher education (3 and 4) assigned political processes a lower partial utility and cooperatives a higher partial utility than respondents with lower education level (1 and 2). Further, their ranking was different: they preferred a membership in energy cooperatives (fourth rank) over political participation (fifth rank).
    - Energy security: the partial utility for the design element **prosumption** (p=.0008) and **global energy imports** (p=.0013) differed between educational levels. Respondents with higher education (3 and 4) assigned a higher partial utility to prosumption. Respondents with lower education (1 and 2) preferred EU imports to prosumption. Respondents with higher education (3 and 4) assigned the least partial utility to global imports for energy security.
    - Policy instruments: utilities from **regulation** (p=.0458), **prohibition** (p=.0001) and information (p=.0001) differed by educational levels. Respondents with education level 3 attributed the lowest partial utility to regulation and prohibition, while individuals with education level 4 assigned the lowest partial utility to information.
    - Willingness to pay for the energy transition differed between educational levels (p = .0924 for 2.5 Euros, p=.0503 for 15 Euro). Albeit the partial utility of low costs was very high, the higher the education level the less important costs became.

- Employment status:

    - Burden sharing: utility scores for **ability-to-pay-rule** (p=.0004) and **competitiveness-pay-rule** (p=.0028) differed between employment status. While those employed assigned a lower partial utility to the ability-to-pay-rule, unemployed respondents considered this rule as highly beneficial. The least support for competitiveness-pay-rule originated from trainees and students, followed by unemployed persons. The latter group also ranked the ability-to-pay rule highest, while all other groups preferred the polluter-pays-rule.
    - Actions: regarding the design rule "**energy cooperatives**" for the dimension actions, students and trainees assigned it a higher partial utility than the average (p=.0011). Partial utilities from **flexible energy consumption** (p=.0884) and **political participation** (p=.0461) also differed: flexible energy consumption provided the lowest partial utility for each employment status, but it was lowest for retired persons (p=.0282 when compared to the mean); political processes provided the least partial utility to trainees and students (p=.0461 when compared to the average).
    - Energy security: there were differences in utility scores between employment status for the design element "**internal EU markets**" (p=.0954) and "**prosumption**" (p=.0020). The latter was the highest for trainees and students while EU import received the lowest support (p=.0002 and p=.0221 compared to the mean).
    - A large distance to wind parks tended to be less of a benefit for retired persons (p=.0213 for 1 km). The willingness to pay more for the energy transition tended to be higher for students and trainees (p=.0004 for WTP of 15 Euro compared to the mean).

- Household size:
  - Burden sharing: there was a significant difference in utility scores by household sizes for the **ability-to-pay rule** (p=.0774); with increasing size the partial utility decreased for this design element.
  - Actions: only the derived partial utility from the design element "**political participation**" differed by household sizes (p=.0809): single households received significantly more partial utility from this design element than the average (p=.0848).
  - Households with more than two persons preferred a larger distance to wind parks (p>.05) than the mean household size. Regarding the willingness to pay more for the energy transition, households with more than three persons displayed a lower "partial disutility" for 10 or 15 Euros than the average (p=.05135 and p=.0890 respectively) and a lower partial utility from paying 5 Euro compared to the average of the sample (p=.0096).
- Federal states:
  - Energy security: **local energy generation** (regional energy supply) was attributed the highest partial utility by the federal state 9 (Niedersachsen, p=.0967) and lowest by the state 15 (Schleswig-Holstein, p=.0239) when compared to the sample average.
  - Policy instruments: the federal state 5 (Bremen) displayed the highest partial utility for **regulations** (p=.0579 compared to the average), and the federal state 14 (Sachsen-Anhalt) and 3 (Berlin) the lowest (p=.0422 and p=.0577, respectively compared to the mean). With respect to **prohibition**, respondents from the federal state 14 (Sachsen-Anhalt) displayed the lowest partial "disutility" (p=.0236 compared to the mean of the sample).
  - Regarding the distance to wind parks, respondents from the federal state 1 (Baden-Württemberg) displayed the lowest partial "disutility" when the wind park is in 500 meters distance, and the federal state 16 (Thuringia) the highest.

5 Discussion and Conclusion

This study is the first of its kind that analyses preferences of German citizens for selected design elements of the energy transition. It applies a method commonly used in marketing to detect preferred product designs. The results provide new insights for policy makers regarding the design of the energy transition.

5.1 Discussion

Although it was not a focus of this study, we also looked into the acceptance of nearby wind parks. We found that the local acceptance tended to be low for respondents with higher education, income and house ownership. This is in contrast to other findings in literature, e.g. Skiniti et al. (2022), who got empirical evidence that acceptance of or attitude towards wind parks is independent of income. However, our sample might differ in that sense that we have analysed the acceptance of citizens living very close to a wind park. The respondents owning a house in close vicinity to a wind park might expect a decrease in the market value of their real estate. Since real estate property is related to high income and high level of education, these two criteria might correlate with acceptance issues driven by economic interests.

Burden sharing is an important dimension of the energy transition, but it was unclear under which conditions and to what extent which type of burden sharing was preferred. We found that sharing of additional costs of the energy transition on the basis of the energy consumption (polluter-pays-rule) was the most preferred design. Since this sharing rule has been applied for the EEG levy, it is familiar to citizens. So, the advocacy of this rule might be supported by the so-called status-quo bias. This is a cognitive bias that leads to an excessive preference for the status-quo over change (Samuelson and Zeckhauser 1988). In addition, according to Beyer et al. (2018), the will to minimise costs for the lower income group decreases significantly under uncertainty. Since the German population was living in a highly uncertain time regarding energy prices at the time of the survey, it is plausible, that households prefer the consumption-based sharing. In line with our findings, the study of Groh and Ziegler (2018) found that the polluter-pays rule receives the highest acceptance in German society in general.

Regarding potential **actions and contributions** of citizens to the energy transition, the utility value was highest for private PV. This is not surprising because the most popular form of financial participation in the ET among Germans is investment in PV systems (Sonnberger & Ruddat, 2016). However, in this context, the study by Römer and Steinbrecher (2020) showed that households with PV systems are also often high-income rural house owners. This implies further efforts of policy makers to facilitate the installation of small balcony PV modules and regulations for small roof top PV plants on third-party property.

Under the dimension **energy security**, a regional or decentralised energy supply was mostly preferred. This is in line with findings of Sonnberger and Ruddat (2016). The energy crisis in the wake of Russia's attack on Ukraine has shown a high vulnerability of the German energy supply, leading to a higher demand for self-supply. In addition, a strong motivation for investments in RE projects of citizens has been the desire for autonomy (see Breitschopf and Burghard (2023)). A further explanation for the preference for regional supply could come from the idea that "regionality is a trend" (Lang 2020). In daily consumption, regionality has established itself as a new product characteristic, which results in some studies showing that regionality is now more important to consumers than organic products (Marketing 2017).

Regarding **policy instruments**, information and appeals were the most preferred instruments. About 45% of Germans feel insufficiently informed about the ET (Sonnberger & Ruddat, 2016) and 20% to 30% about potential investments into the energy transition (Breitschopf et al. 2023, Breitschopf and Burghard 2023). This lack of knowledge and the fact that there exists no actual reason objecting information might explain why German households prefer government measures for a sustainable energy transition in the form of information and appeal.

Regarding the potential influence of socio-demographic features, we found some significant differences between the sub-samples with respect to the preferences for design elements. The design elements with a collective character (cooperatives) are more preferred by young respondents, trainees or students and persons with a higher educational level while discursive participation (political participation) is less preferred by young persons, trainees and students, and by households with two or more persons. Accounting for social disadvantaged groups, employed persons and households with four or more family members rather expected disadvantages from the ability-to-pay rule while unemployed considered it as beneficial. Prosumption was rated positively by young persons, respondents with higher education, and trainees or students.

5.2 Limitations and further need for research

These findings give evidence that the actual costs of the energy transition are a key factor for acceptance, and the way how costs are distributed in the ET seems to be also very important for households. This contrasts with previous findings of Breitschopf and Burghard (2023), who found that without trade-offs between design elements of the dimensions, the dimension ensuring independency from energy imports achieved in average the highest agreement. In the case of weakly opposing design options such as investments in renewable energies and energy efficiency, respondents might be rather indifferent between the options and, therefore, do not assign them much attention, while strongly opposing options such as polluter-pays-rule and competitiveness-pay-rule might gain high attention and might be either considered as clearly beneficial or detrimental with respect to their utility. This means that the preference for the dimensions depend on the intensity of contrast between the selected design elements per dimension.

Regarding the method, discrete choice experiments are usually prone to hypothetical bias. This means that respondents may indicate a preference even though this choice does not necessarily reflect their real preferences. A similar bias resulting from the methodology of handing out a survey is that individuals tend to answer questions in the way they consider it socially desirable (Homburg 2017). This phenomenon can make respondents answer a question in a survey affirmatively, even if in reality their choice is different from their survey answer. One way to solve this limitation is to conduct interviews with people in a future study on the topic of the desired design elements of the energy transition. Within interviews, an environment of trust can be created with respondents. In combination with knowledge about the personal background of the respondents, more realistic answers can be obtained. Afterwards, the data from the interview study could be compared with this study to verify the results presented here. One requirement of using a conjoint analysis is that there should be no interactions among the dimensions (Green and Srinivasan 1978). Given the complexity of designs, the difficult delineation of design characteristics, e.g. between burden sharing and WTP as well as the individually perceived characteristics, we cannot exclude interactions. This is a weakness of this approach.

Another limitation of the study are the possible knowledge gaps of the population with regard to financial participation in the energy transition. A survey conducted by the Agency for Renewable Energies in Germany showed that almost 50% of the respondents were not aware of any of the participation models in renewable energy projects (AEE 2021). The dimensions and design characteristics of the energy transition also represent topics that many people might not be familiar with. Future studies could address this point by providing information on the design elements.

Furthermore, the sample may seem very large at first glance, but it is relatively small compared to the German population as a whole, which limits the generalisability of the results. In addition, individuals in lower income groups are overrepresented compared to the German population. This fact can potentially have an impact on the reported willingness to pay and on the preferences regarding the attribute characteristics (design characteristics) in the dimension burden sharing of ET costs (distributional aspects).

5.3 Conclusion

This study analysed how the energy transition should be designed from the perspective of citizens. Based on a review of documents and papers dealing with the strategy and implementation of the energy transition, it identified features of the energy transition encompassing attributes such as policy instruments, actions supporting the energy transition, burden sharing and energy security options. Vicinity to wind parks and willingness to pay for the energy transition were included as well as attributes to capture notions of costs and benefits. We applied a conjoint analysis to identify which attribute levels are preferred to others. More than 2000 citizens participated in the study via an online survey. The results of this study support the findings of Sonnberger and Ruddat (2016) on the favour of German citizens of a more decentralised energy supply: citizens prefer a decentralised regional energy supply if possible, in form of prosumption. The results could draw upon the insights from the domain product marketing in the food sector, in which regionality is recognised as a key product feature (Lang 2020; Wegmann 2015). It seems that regionality of energy generation, e.g. in form of prosumption, could be attributed much importance in the design and implementation of the energy transition. This regionality principle could be used as a branding for further actions such as installing renewable energy projects in communities. However, regionality should not be at the expense of economic efficiency, which means that efficient renewable energy potentials should be exploited first. Therefore, cooperations between regions should be included into the regionality principle to ensure a cost-efficient transition.

Further, our study reveals that PV systems are the preferred action and contribution of citizens to the energy transition. Thus it underlines the findings of Sonnberger and Ruddat (2016) that the most popular form of financial participation among Germans is the investment in small PV systems (roof top). Taking these findings together, our results suggest that small PV plants as a means of financial participation and secure energy supply are well suited to further promote and push the energy transition. Thus, facilitating installations of small balcony modules and small roof top PV plants on third-party property as a way to financially participate in the energy transition could further increase the acceptance of the energy transition (see Breitschopf and Burghard (2023)).

Another aspect is burden sharing. Burden sharing in form of a polluter-pays rule has been the preferred rule (Fanghella et al. 2023) but so far it has been unclear under which conditions, i.e. expenses, this burden sharing is important. This study could show that burden sharing of costs related to the energy transition gains more attention and importance than energy security issues under the current design elements, but should not occur at the expense of higher energy costs (WTP). Energy costs of consumers is the most important factor and trade-offs to energy security or burden sharing are small. However, in case energy security is endangered, then higher energy costs are accepted to reduce dependency and the exposure to high energy prices. Thus, policy makers could expect German citizens to pay a kind of premium for energy security issues, i.e. avoiding exposure to high prices.

6 List of figures

7 List of tables

A.1 Survey

A.1.1 Quota

Quota Gender

weiblich (1)	958 / 1100	87%
maennlich (2)	1052 / 1100	95%
divers (3)	1 / 732	0%

Quota Age

achtzehnBISdreisig (2)	370 / 396	93%
dreisigBISvierzig (3)	363 / 418	86%
vierzigBISfuenfzig (4)	388 / 462	83%
fuenfzigBISsechzig (5)	450 / 462	97%
sechzigBISsiebzig (6)	438 / 462	94%

Quota Education

Niedrig (1)	387 / 704	54%
Mittel (2)	758 / 774	97%
Hoch (3)	365 / 363	[closed] 100%
Studium (4)	501 / 510	98%

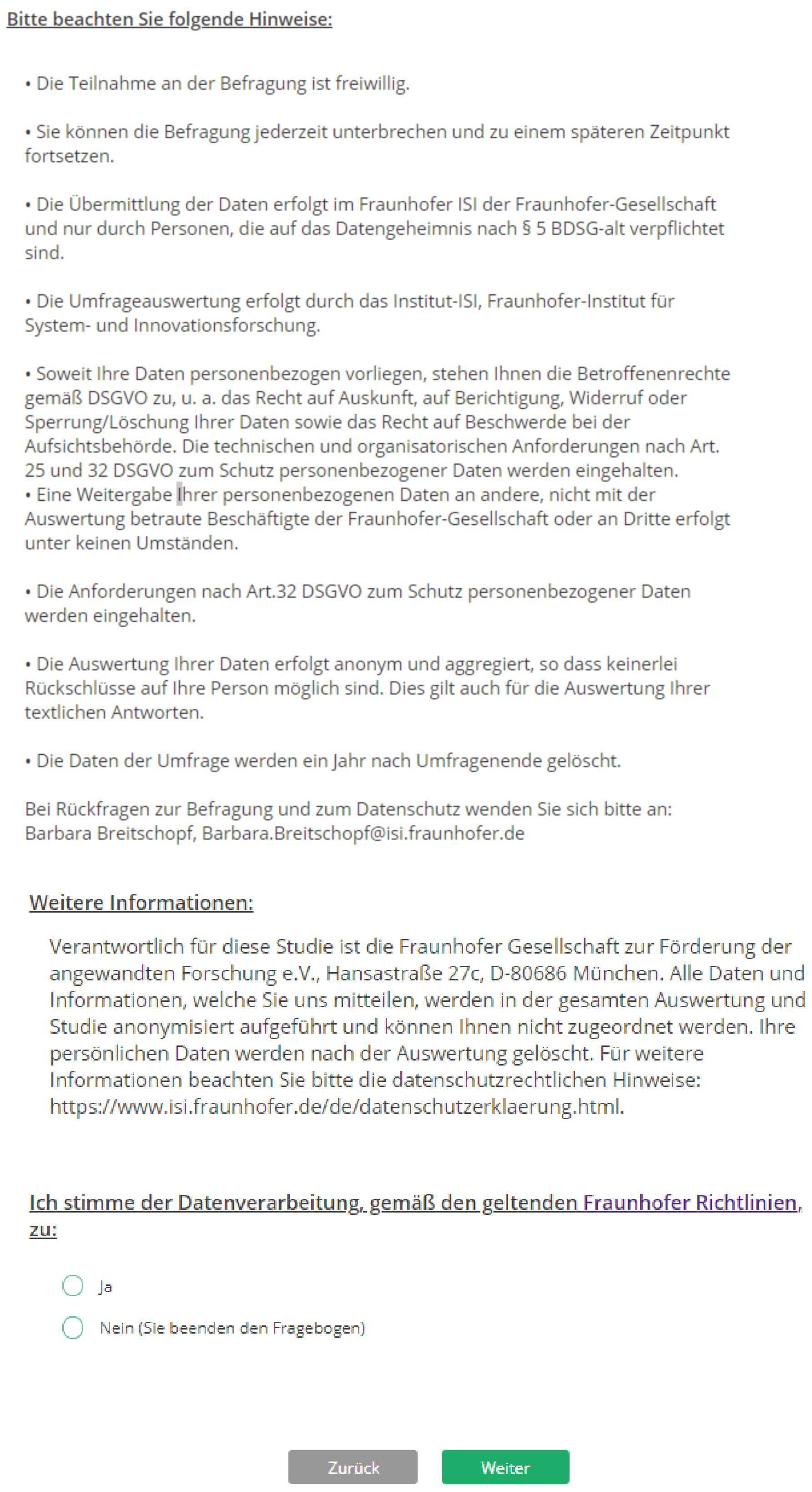
Quota Household Size

einePerson (1)	542 / 550	98%
zweiPersonen (2)	1002 / 1166	85%
drePersonen (3)	281 / 286	98%
vierPersonenUndMehr (4)	184 / 198	92%

Quota Occupation

Berufstaetig (1)	1299 / 1548	83%
Ausbildung (2)	157 / 169	92%
Rentner (3)	385 / 502	76%
Arbeitslos (4)	170 / 169	[closed] 100%

A.1.2 Questionnaire



Herzlich willkommen zu dieser Umfrage.

Aktuell bemüht sich Deutschland um eine zuverlässige, saubere und ausreichende Energieversorgung. Dazu werden verschiedene Maßnahmen wie der (beschleunigte) Ausbau erneuerbarer Energien oder beispielsweise der Gasimport aus Katar diskutiert. Wir möchten gerne Ihre Meinung dazu wissen. Auf den nächsten Seiten zeigen wir Ihnen verschiedene Möglichkeiten auf, wie eine sichere und saubere Energieversorgung in Zukunft realisiert werden könnte. Zuvor beginnen wir mit ein paar generellen Fragen.

Zurück Weiter

0% 100%

Welches Beispiel wurde im Eingangstext genannt?

- Gasimport aus den USA
- Gasimport aus den Vereinigten Arabischen Emiraten
- Gasimport aus Katar
- Ölimport aus den USA
- Ölimport aus den Vereinigten Arabischen Emiraten
- Ölimport aus Katar

Zurück Weiter

0% 100%

Bitte geben Sie Ihr Geschlecht an:

- Weiblich
- Männlich
- Divers

[QUOTA: Gender]

Zurück Weiter

0% 100%

Bitte geben Sie Ihr Alter an:

- unter 18 Jahre
- 18-29 Jahre
- 30-39 Jahre
- 40-49 Jahre
- 50-59 Jahre
- 60-69 Jahre
- 70 Jahre oder älter

[QUOTA: AlterQuota]

Zurück Weiter

0% 100%

Was ist ihr höchster Bildungsabschluss?

- ◯ (noch) kein allgemeiner Schulabschluss, noch Schüler in allgemeinbildender **Schule**: Haupt-/ Volks-/ Grundschulabschluss mit oder ohne abgeschlossener Lehre/Berufsausbildung
- ◯ **weiterführende Schule** ohne Abitur (Realschulabschluss/Mittlere Reife/Oberschule) oder gleichwertiger Abschluss
- ◯ **Abitur**, (Fach-) Hochschulreife ohne Studium
- ◯ **Studium** (Universität, Hochschule, Fachhochschule, Polytechnikum)

[QUOTA: Bildung]

Zurück | Weiter

0% 100%

Wie groß ist Ihr Haushalt?

Beinhaltet Personen <u>über</u> 14 Jahre, inklusiv Ihnen selbst

- ◯ 1 Person
- ◯ 2 Personen
- ◯ 3 Personen
- ◯ 4 Personen und mehr

[QUOTA: Haushalt]

Zurück | Weiter

0% 100%

Was trifft überwiegend auf Sie zu?

- ◯ Ich bin **berufstätig** (inkl. Elternzeit, Altersteilzeit)
- ◯ Ich bin in **Ausbildung** (Lehrling, Auszubildender, Student:in, Schüler:in)
- ◯ Ich bin **Renter:in** / Pensionär:in
- ◯ Ich bin **nicht berufstätig** (übe keinen Beruf aus)

[QUOTA: Beruf]

Zurück Weiter

0% 100%

In welchem Bundesland wohnen Sie?

- ◯ Baden-Württemberg
- ◯ Bayern
- ◯ Berlin
- ◯ Brandenburg
- ◯ Bremen
- ◯ Hamburg
- ◯ Hessen
- ◯ Mecklenburg-Vorpommern
- ◯ Niedersachsen
- ◯ Nordrhein-Westfalen
- ◯ Rheinland-Pfalz
- ◯ Saarland
- ◯ Sachsen
- ◯ Sachsen-Anhalt
- ◯ Schleswig-Holstein
- ◯ Thüringen

Zurück Weiter

0% 100%

Wie wohnen Sie?

In einem/r...

- ◯ Eigenen Haus
- ◯ Eigentumswohnung
- ◯ Gemieteten Haus (auch Wohngemeinschaft im Haus)
- ◯ Gemieteten Wohnung (auch Wohngemeinschaft in Wohnung)
- ◯ Sonstiges

Zurück Weiter

0% 100%

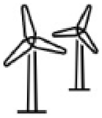
Wie hoch war das Nettoeinkommen ihres Haushalts im letzten Monat insgesamt?

Beinhaltet Unterhalts-, Kindergeld und sonstige regelmäßige Bezüge

- ◯ Unter/ gleich 1.500€
- ◯ 1.501 bis 2.600€
- ◯ 2.601 bis 3.600€
- ◯ 3.600 bis 5.000€
- ◯ 5.001 bis 7.000€
- ◯ Mehr als 7.000€
- ◯ Weiß ich nicht

Zurück Weiter

0% 100%



Gibt es in Ihrem direkten Wohnumfeld von ca. 1 km Umkreis eine/n Windkraftanlage (Windrad)/ Windpark?

Wenn Ja, wie lange schon?

- Ja, ungefähr seit
- Nein
- Weiß nicht

Zurück Weiter

0% 100%

Sie haben angegeben, dass in Ihrem direkten Wohnumfeld eine Windkraftanlage existiert. **Was trifft am ehesten für Sie persönlich zu?**

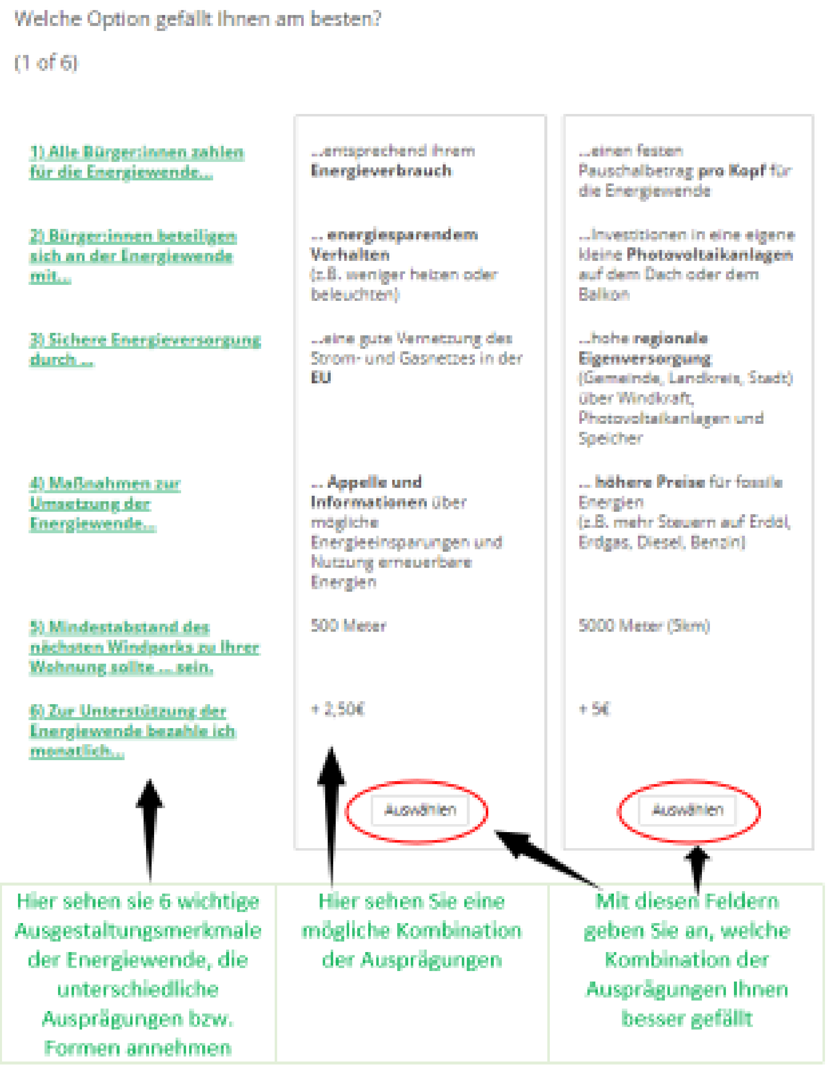
- die Windkraftanlage stört mich, ich toleriere diese nicht
- die Windkraftanlage ist mir egal, ich toleriere diese
- ich finde die Windkraftanlage gut und akzeptiere diese

Zurück Weiter

0% 100%

Anleitung für den Fragebogen

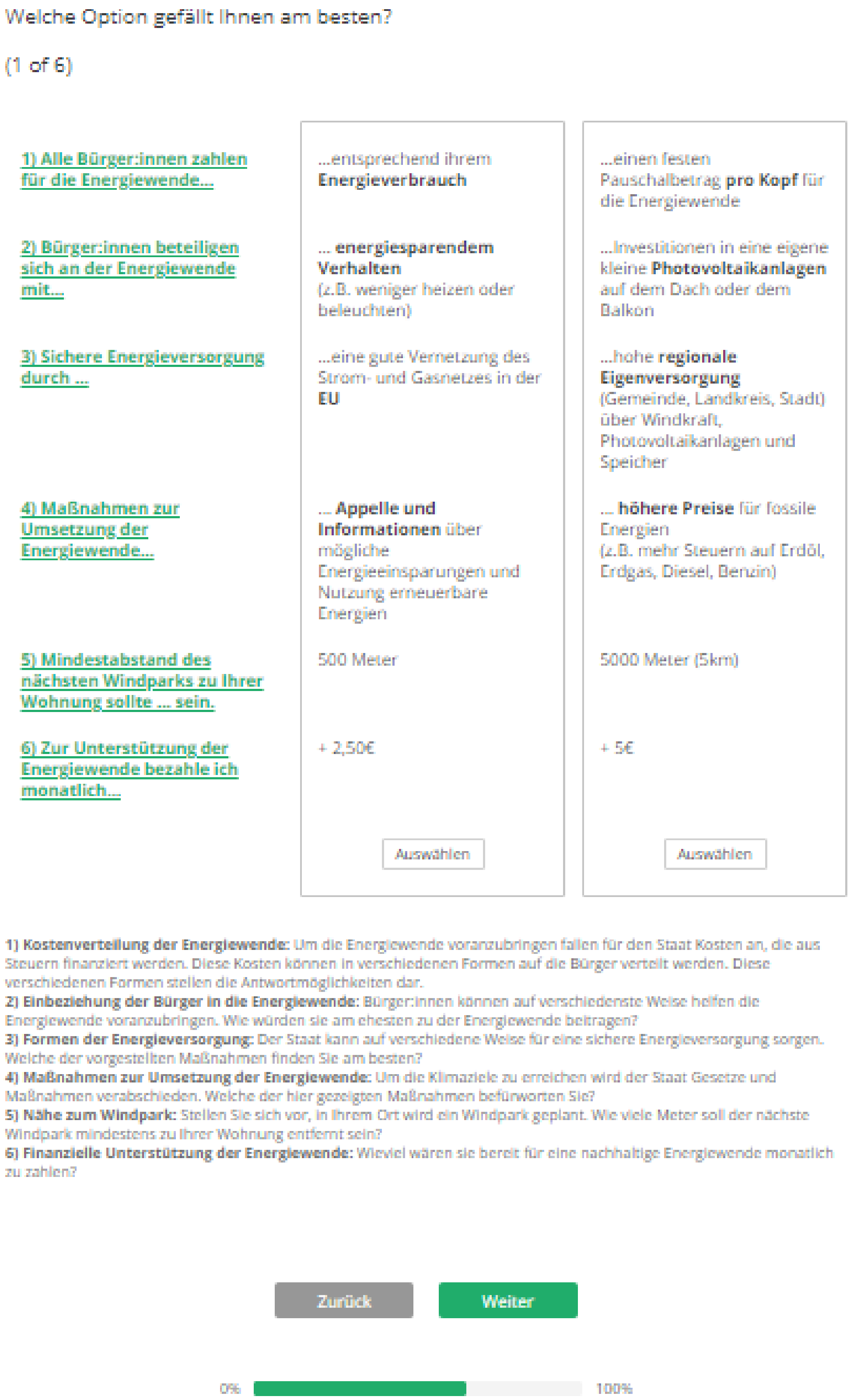
Auf den nächsten Seiten zeigen wir Ihnen immer zwei Möglichkeiten, wie die Energiewende umgesetzt werden könnte. Diese Möglichkeiten sind in zwei Spalten beschrieben, wie hier:



Wählen Sie die Spalte aus, die die Energiewende beschreibt, die Ihnen besser gefällt.

Zurück Weiter

0% 100%



Welche Option gefällt Ihnen am besten?

(1 of 6)

1) Alle Bürger:innen zahlen für die Energiewende…	…entsprechend ihrem **Energieverbrauch**	…einen festen Pauschalbetrag **pro Kopf** für die Energiewende
2) Bürger:innen beteiligen sich an der Energiewende mit…	… **energiesparendem Verhalten** (z.B. weniger heizen oder beleuchten)	…Investitionen in eine eigene kleine **Photovoltaikanlagen** auf dem Dach oder dem Balkon
3) Sichere Energieversorgung durch …	…eine gute Vernetzung des Strom- und Gasnetzes in der **EU**	…hohe **regionale Eigenversorgung** (Gemeinde, Landkreis, Stadt) über Windkraft, Photovoltaikanlagen und Speicher
4) Maßnahmen zur Umsetzung der Energiewende…	… **Appelle und Informationen** über mögliche Energieeinsparungen und Nutzung erneuerbare Energien	… **höhere Preise** für fossile Energien (z.B. mehr Steuern auf Erdöl, Erdgas, Diesel, Benzin)
5) Mindestabstand des nächsten Windparks zu Ihrer Wohnung sollte … sein.	500 Meter	5000 Meter (5km)
6) Zur Unterstützung der Energiewende bezahle ich monatlich…	+ 2,50€	+ 5€
	Auswählen	Auswählen

1) Kostenverteilung der Energiewende: Um die Energiewende voranzubringen fallen für den Staat Kosten an, die aus Steuern finanziert werden. Diese Kosten können in verschiedenen Formen auf die Bürger verteilt werden. Diese verschiedenen Formen stellen die Antwortmöglichkeiten dar.
2) Einbeziehung der Bürger in die Energiewende: Bürger:innen können auf verschiedenste Weise helfen die Energiewende voranzubringen. Wie würden sie am ehesten zu der Energiewende beitragen?
3) Formen der Energieversorgung: Der Staat kann auf verschiedene Weise für eine sichere Energieversorgung sorgen. Welche der vorgestellten Maßnahmen finden Sie am besten?
4) Maßnahmen zur Umsetzung der Energiewende: Um die Klimaziele zu erreichen wird der Staat Gesetze und Maßnahmen verabschieden. Welche der hier gezeigten Maßnahmen befürworten Sie?
5) Nähe zum Windpark: Stellen Sie sich vor, in Ihrem Ort wird ein Windpark geplant. Wie viele Meter soll der nächste Windpark mindestens zu Ihrer Wohnung entfernt sein?
6) Finanzielle Unterstützung der Energiewende: Wieviel wären sie bereit für eine nachhaltige Energiewende monatlich zu zahlen?

Zurück Weiter

0% 100%

Welche Option gefällt Ihnen am besten?

(2 of 6)

1) Alle Bürger:innen zahlen für die Energiewende...	...entsprechend ihrem **Energieverbrauch**	...aber große Energieverbraucher **(Industrie)** zahlen etwas **weniger**, die anderen dafür etwas mehr
2) Bürger:innen beteiligen sich an der Energiewende mit...	...Investitionen in **Energieeffizienz** (effiziente Elektrogeräte A++, Gebäudedämmung)	... **Anpassung** ihres **Energieverbrauch** (z.B. nur Kochen/ Wäsche waschen, wenn viel Strom aus Windkraft oder Solaranlagen verfügbar ist)
3) Sichere Energieversorgung durch ...	...eigene **private Energieerzeugung** Photovoltaik-Aufdach-Anlage(n) mit Batteriespeicher(n)	...hohe **regionale Eigenversorgung** (Gemeinde, Landkreis, Stadt) über Windkraft, Photovoltaikanlagen und Speicher
4) Maßnahmen zur Umsetzung der Energiewende...	...**Vorschriften/** Regulierungen (z.B. Emissionsgrenzen bei Auto, Heizungen, oder Effizienzvorschriften bei Gebäuden und Elektrogeräten)	...**Verbote** (z.B. von Ölheizung, Autos mit Kraftstoffmotoren, etc.)
5) Mindestabstand des nächsten Windparks zu Ihrer Wohnung sollte ... sein.	1000 Meter	500 Meter
6) Zur Unterstützung der Energiewende bezahle ich monatlich...	+ 15€	+ 10€
	Auswählen	Auswählen

1) Kostenverteilung der Energiewende: Um die Energiewende voranzubringen fallen für den Staat Kosten an, die aus Steuern finanziert werden. Diese Kosten können in verschiedenen Formen auf die Bürger verteilt werden. Diese verschiedenen Formen stellen die Antwortmöglichkeiten dar.
2) Einbeziehung der Bürger in die Energiewende: Bürger:innen können auf verschiedenste Weise helfen die Energiewende voranzubringen. Wie würden sie am ehesten zu der Energiewende beitragen?
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6) Finanzielle Unterstützung der Energiewende: Wieviel wären sie bereit für eine nachhaltige Energiewende monatlich zu zahlen?

Welche Option gefällt Ihnen am besten?

(3 of 6)

1) Alle Bürger:innen zahlen für die Energiewende...	...aber **Einkommensschwache zahlen etwas weniger**, die anderen dafür etwas mehr	...aber **Einkommensschwache zahlen etwas weniger**, die anderen dafür etwas mehr
2) Bürger:innen beteiligen sich an der Energiewende mit...	... **ehrenamtlichem Engagement** wie Beteiligung an Bürgerinitiativen und politischen Prozessen	... **finanziellen Investitionen** (z.B. Energiegenossenschaften, Bürger/Gemeindeprojekten, Investitionsanteil an Windparks)
3) Sichere Energieversorgung durch ...	...eine gute Vernetzung des Strom- und Gasnetzes in der **EU**	...**Energieimporte** aus vielen verschiedenen Ländern
4) Maßnahmen zur Umsetzung der Energiewende...	...**Verbote** (z.B. von Ölheizung, Autos mit Kraftstoffmotoren, etc.)	... **Appelle und Informationen** über mögliche Energieeinsparungen und Nutzung erneuerbare Energien
5) Mindestabstand des nächsten Windparks zu Ihrer Wohnung sollte ... sein.	1000 Meter	5000 Meter (5km)
6) Zur Unterstützung der Energiewende bezahle ich monatlich...	+ 5€	+ 2,50€
	Auswählen	Auswählen

1) Kostenverteilung der Energiewende: Um die Energiewende voranzubringen fallen für den Staat Kosten an, die aus Steuern finanziert werden. Diese Kosten können in verschiedenen Formen auf die Bürger verteilt werden. Diese verschiedenen Formen stellen die Antwortmöglichkeiten dar.
2) Einbeziehung der Bürger in die Energiewende: Bürger:innen können auf verschiedenste Weise helfen die Energiewende voranzubringen. Wie würden sie am ehesten zu der Energiewende beitragen?
3) Formen der Energieversorgung: Der Staat kann auf verschiedene Weise für eine sichere Energieversorgung sorgen. Welche der vorgestellten Maßnahmen finden Sie am besten?
4) Maßnahmen zur Umsetzung der Energiewende: Um die Klimaziele zu erreichen wird der Staat Gesetze und Maßnahmen verabschieden. Welche der hier gezeigten Maßnahmen befürworten Sie?
5) Nähe zum Windpark: Stellen Sie sich vor, in Ihrem Ort wird ein Windpark geplant. Wie viele Meter soll der nächste Windpark mindestens zu Ihrer Wohnung entfernt sein?
6) Finanzielle Unterstützung der Energiewende: Wieviel wären sie bereit für eine nachhaltige Energiewende monatlich zu zahlen?

Zurück | Weiter

0% 100%

Welche Option gefällt Ihnen am besten?

(4 of 6)

1) Alle Bürger:innen zahlen für die Energiewende...	...aber große Energieverbraucher **(Industrie)** zahlen etwas **weniger**, die anderen dafür etwas mehr	...einen festen Pauschalbetrag **pro Kopf** für die Energiewende
2) Bürger:innen beteiligen sich an der Energiewende mit...	...Investitionen in eine eigene kleine **Photovoltaikanlagen** auf dem Dach oder dem Balkon	... **finanziellen Investitionen** (z.B. Energiegenossenschaften, Bürger/Gemeindeprojekten, Investitionsanteil an Windparks)
3) Sichere Energieversorgung durch ...	...**Energieimporte** aus vielen verschiedenen Ländern	...eigene **private Energieerzeugung** Photovoltaik-Aufdach-Anlage(n) mit Batteriespeicher(n)
4) Maßnahmen zur Umsetzung der Energiewende...	... **Appelle und Informationen** über mögliche Energieeinsparungen und Nutzung erneuerbare Energien	... **höhere Preise** für fossile Energien (z.B. mehr Steuern auf Erdöl, Erdgas, Diesel, Benzin)
5) Mindestabstand des nächsten Windparks zu Ihrer Wohnung sollte ... sein.	5000 Meter (5km)	500 Meter
6) Zur Unterstützung der Energiewende bezahle ich monatlich...	+ 15€	+ 10€
	Auswählen	Auswählen

1) Kostenverteilung der Energiewende: Um die Energiewende voranzubringen fallen für den Staat Kosten an, die aus Steuern finanziert werden. Diese Kosten können in verschiedenen Formen auf die Bürger verteilt werden. Diese verschiedenen Formen stellen die Antwortmöglichkeiten dar.
2) Einbeziehung der Bürger in die Energiewende: Bürger:innen können auf verschiedenste Weise helfen die Energiewende voranzubringen. Wie würden sie am ehesten zu der Energiewende beitragen?
3) Formen der Energieversorgung: Der Staat kann auf verschiedene Weise für eine sichere Energieversorgung sorgen. Welche der vorgestellten Maßnahmen finden Sie am besten?
4) Maßnahmen zur Umsetzung der Energiewende: Um die Klimaziele zu erreichen wird der Staat Gesetze und Maßnahmen verabschieden. Welche der hier gezeigten Maßnahmen befürworten Sie?
5) Nähe zum Windpark: Stellen Sie sich vor, in Ihrem Ort wird ein Windpark geplant. Wie viele Meter soll der nächste Windpark mindestens zu Ihrer Wohnung entfernt sein?
6) Finanzielle Unterstützung der Energiewende: Wieviel wären sie bereit für eine nachhaltige Energiewende monatlich zu zahlen?

Zurück | Weiter

0% 100%

Welche Option gefällt Ihnen am besten?

(5 of 6)

1) Alle Bürger:innen zahlen für die Energiewende…	…aber große Energieverbraucher **(Industrie)** zahlen etwas **weniger**, die anderen dafür etwas mehr	…entsprechend ihrem **Energieverbrauch**
2) Bürger:innen beteiligen sich an der Energiewende mit…	… **energiesparendem Verhalten** (z.B. weniger heizen oder beleuchten)	…Investitionen in **Energieeffizienz** (effiziente Elektrogeräte A++, Gebäudedämmung)
3) Sichere Energieversorgung durch …	…**Energieimporte** aus vielen verschiedenen Ländern	…eine gute Vernetzung des Strom- und Gasnetzes in der **EU**
4) Maßnahmen zur Umsetzung der Energiewende…	…**Vorschriften/** Regulierungen (z.B. Emissionsgrenzen bei Auto, Heizungen, oder Effizienzvorschriften bei Gebäuden und Elektrogeräten)	…**Verbote** (z.B. von Ölheizung, Autos mit Kraftstoffmotoren, etc.)
5) Mindestabstand des nächsten Windparks zu Ihrer Wohnung sollte … sein.	1000 Meter	500 Meter
6) Zur Unterstützung der Energiewende bezahle ich monatlich…	+ 5€	+ 15€
	Auswählen	Auswählen

1) Kostenverteilung der Energiewende: Um die Energiewende voranzubringen fallen für den Staat Kosten an, die aus Steuern finanziert werden. Diese Kosten können in verschiedenen Formen auf die Bürger verteilt werden. Diese verschiedenen Formen stellen die Antwortmöglichkeiten dar.
2) Einbeziehung der Bürger in die Energiewende: Bürger:innen können auf verschiedenste Weise helfen die Energiewende voranzubringen. Wie würden sie am ehesten zu der Energiewende beitragen?
3) Formen der Energieversorgung: Der Staat kann auf verschiedene Weise für eine sichere Energieversorgung sorgen. Welche der vorgestellten Maßnahmen finden Sie am besten?
4) Maßnahmen zur Umsetzung der Energiewende: Um die Klimaziele zu erreichen wird der Staat Gesetze und Maßnahmen verabschieden. Welche der hier gezeigten Maßnahmen befürworten Sie?
5) Nähe zum Windpark: Stellen Sie sich vor, in Ihrem Ort wird ein Windpark geplant. Wie viele Meter soll der nächste Windpark mindestens zu Ihrer Wohnung entfernt sein?
6) Finanzielle Unterstützung der Energiewende: Wieviel wären sie bereit für eine nachhaltige Energiewende monatlich zu zahlen?

Zurück Weiter

0% 100%

Welche Option gefällt Ihnen am besten?

(6 of 6)

1) Alle Bürger:innen zahlen für die Energiewende...	...einen festen Pauschalbetrag **pro Kopf** für die Energiewende	...aber große Energieverbraucher **(Industrie)** zahlen etwas **weniger**, die anderen dafür etwas mehr
2) Bürger:innen beteiligen sich an der Energiewende mit...	... **ehrenamtlichem Engagement** wie Beteiligung an Bürgerinitiativen und politischen Prozessen	... **Anpassung** ihres **Energieverbrauch** (z.B. nur Kochen/ Wäsche waschen, wenn viel Strom aus Windkraft oder Solaranlagen verfügbar ist)
3) Sichere Energieversorgung durch ...	...eigene **private Energieerzeugung** Photovoltaik-Aufdach-Anlage(n) mit Batteriespeicher(n)	...eigene **private Energieerzeugung** Photovoltaik-Aufdach-Anlage(n) mit Batteriespeicher(n)
4) Maßnahmen zur Umsetzung der Energiewende...	...**Vorschriften/** Regulierungen (z.B. Emissionsgrenzen bei Auto, Heizungen, oder Effizienzvorschriften bei Gebäuden und Elektrogeräten)	... **höhere Preise** für fossile Energien (z.B. mehr Steuern auf Erdöl, Erdgas, Diesel, Benzin)
5) Mindestabstand des nächsten Windparks zu Ihrer Wohnung sollte ... sein.	5000 Meter (5km)	1000 Meter
6) Zur Unterstützung der Energiewende bezahle ich monatlich...	+ 10€	+ 2,50€
	Auswählen	Auswählen

1) Kostenverteilung der Energiewende: Um die Energiewende voranzubringen fallen für den Staat Kosten an, die aus Steuern finanziert werden. Diese Kosten können in verschiedenen Formen auf die Bürger verteilt werden. Diese verschiedenen Formen stellen die Antwortmöglichkeiten dar.
2) Einbeziehung der Bürger in die Energiewende: Bürger:innen können auf verschiedenste Weise helfen die Energiewende voranzubringen. Wie würden sie am ehesten zu der Energiewende beitragen?
3) Formen der Energieversorgung: Der Staat kann auf verschiedene Weise für eine sichere Energieversorgung sorgen. Welche der vorgestellten Maßnahmen finden Sie am besten?
4) Maßnahmen zur Umsetzung der Energiewende: Um die Klimaziele zu erreichen wird der Staat Gesetze und Maßnahmen verabschieden. Welche der hier gezeigten Maßnahmen befürworten Sie?
5) Nähe zum Windpark: Stellen Sie sich vor, in Ihrem Ort wird ein Windpark geplant. Wie viele Meter soll der nächste Windpark mindestens zu Ihrer Wohnung entfernt sein?
6) Finanzielle Unterstützung der Energiewende: Wieviel wären sie bereit für eine nachhaltige Energiewende monatlich zu zahlen?

Zurück Weiter

0% 100%

Vielen Dank für Ihre Teilnahme!

Note:

When respondents take the survey in regular mode they will be redirected to the url below after 2 seconds:

[redacted]

Zurück Weiter

Note:

This is a terminating page. The navigation button(s) only appear on this page in preview mode.

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A.2 Analytical methods

A.2.1 COUNT-method

The COUNT-method is a counting method that provides estimates of main effects and side effects for a CBC dataset, by calculating a proportion for each attribute based on how often that attribute was selected within a concept. This is done by dividing the frequency with which the attribute was selected by the frequency with which it is queried. This method of analysis is useful for summarising important relationships, such as the interaction between brand and price (Sawtooth Software, 2017a). This allows to make general statements about the preferences of level combinations.

A.2.2 LOGIT-method

The estimates from the logit analysis are very similar to the COUNT-method estimates. The differences are due to a slight imbalance in the randomised design, and the logit analysis estimates are slightly more accurate (Sawtooth Software, 2017a). The LOGIT-method reports t- and chi-square statistics. Thus, this method can estimate main effects and mutual interactions.

A disadvantage of the LOGIT-method is that it is sensitive to the independence axiom. According to the independence axiom, a decision maker's preference towards two alternatives is independent of whether he evaluates them individually or in the context of other alternatives in a more complex decision situation. When applying the LOGIT-method, it sometimes occurred that a new alternative in a choice simulation took shares of existing products proportional to their shares. Cross-elasticities and substitution rates between competing products were assumed to be equal, which was not perceived to be realistic (Orme, Hierarchical Bayes: Why All the Attention?, 2000).

In summary, the LOGIT-method is an effective tool to report statistics. However, it is not possible to gain additional insights based on market segments and to develop more accurate market simulators with the LOGIT-method. Against this background, the LOGIT-method will not be applied in this thesis.

A.2.3 Hierarchical Bayesian method

Hierarchical Bayesian (HB) is as easy to use as Aggregate Logit, but disaggregated models like HB give much more robust results in terms of analytical problems (Sawtooth Software, 2017a).

The strength of HB lies in its ability to provide estimates for the individuals when only a few choices of each are given, which allows marketers to target individuals more accurately (Orme, Hierarchical Bayes: Why All the Attention?, 2000). This is done by "borrowing" information from mean and covariances describing the preferences of other respondents in the same data set (Howell, 2009).

It is these individual-level estimates that improve the accuracy of market simulations and lead to a better understanding of market structure and attribute importance (Sawtooth Software , 2022), whereas the accuracy of the aggregate logit model is rather weak.

Individual utility values are helpful to allow for easy segmentation and thus to identify different groups. However, since people are different in nature and accordingly have different preferences, combining samples into a single set is not always accurate (Howell, 2009). With the help of HB, it is possible to identify the segments that do not match and to address them separately. It is also possible to predict individual market decisions and create accurate what-if simulators that respond to different preferences with HB (ibid.).

To sum up, HB's strongest ability is to provide individual part-worths estimates when only little information for each respondent is given (Sawtooth Software, 2021a). HB estimations regularly match and usually beat traditional models.

Latent Class Multinomial Logit (MNL)

Another valuable method for analysing choice data is latent class analysis. This can identify segments of naturals with similar preferences and is thus an additional valuable method (Sawtooth Software, 2021b).

The Latent Class model generally provides more insight into the structure of respondent preferences than the LOGIT-method. In addition, the results of the market simulations are generally more accurate than similarly defined aggregate models. Another strength of the latent class approach is that it reduces the negative effects of the independence axiom.

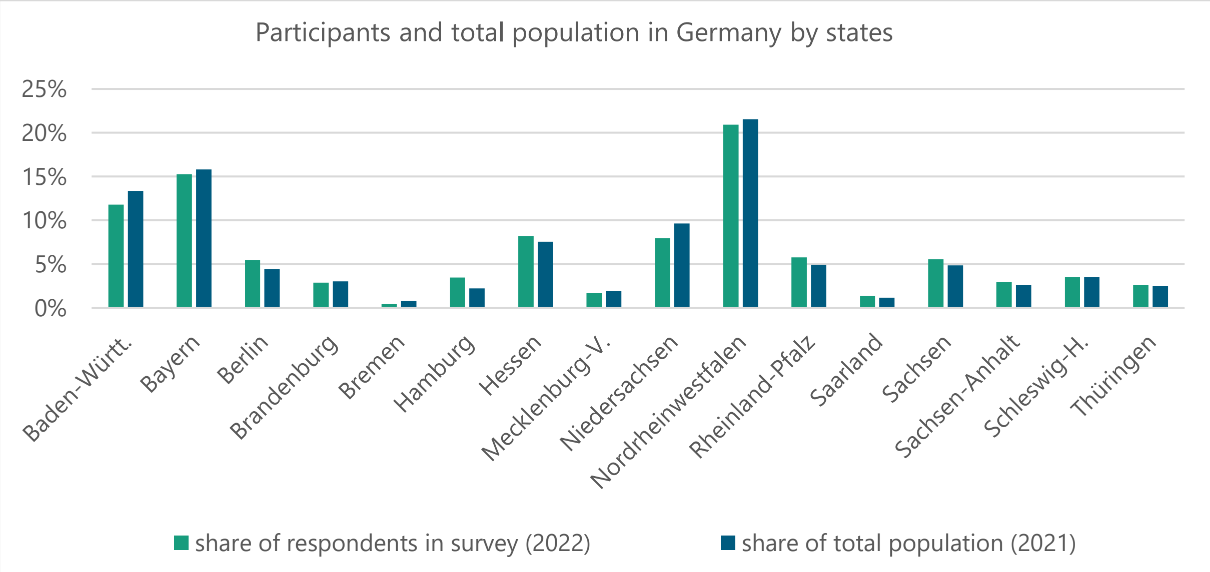
Instead of calculating the average utility as in the HB method, sub-groups with different preferences are identified and estimates for the utilities of the segments are calculated. In the analysis, a segment size can be decided individually.

In summary, Latent Class provides similar results to the LOGIT method. However, Latent Class MNL focuses on robust results for different groups and is good at reducing the IIA problem. Nevertheless, it does not provide accurate estimates at the individual level (Orme, Hierarchical Bayes: Why All the Attention?, 2000).

A.3 Results

A.3.1 Description of the sample

Figure 4: Respondents and total population in Germany by federal states (%)



Source: own data; own illustration based on Destatis 2021

Table 4: Shares by socio-demographic features of respondents by codes

Code	Sex	Age	Educa-tion	House-hold size	Job	State	Dwelling	Monthly income	1 km vicinity WP	Experi-ence WP	Accep-tance WP
N	2011	2009	2011	2009	2011	2011	2011	2011	2011	299	342
1	48%	0%	19%	27%	65%	12%	32%	19%	17%	6%	8%
2	52%	18%	38%	50%	8%	15%	10%	24%	75%	32%	32%
3	0%	18%	18%	14%	19%	5%	6%	21%	8%	29%	60%
4		19%	25%	9%	8%	3%	51%	20%			
5		22%				0%	1%	8%			
6		22%				3%		2%			
7		0%				8%		6%			
8						2%					
9						8%					
10						21%					
11						6%					
12						1%					
13						6%					
14						3%					

Code	Sex	Age	Educa-tion	House-hold size	Job	State	Dwelling	Monthly income	1 km vicinity WP	Experi-ence WP	Accep-tance WP
15						4%					
16						3%					

Explanation of the codes used in Table 4

Code	Sex	Age	Education	House-hold size	Employ-ment	State	Dwelling	Monthly income	1 km vicinity WP	Experi-ence WP	Acceptance WP
1	female	<18	primary w/o apprentice-ship	1	employed	Baden-Württ.	own house	≤€1500	yes	≤2 years	negative, no
2	male	18-29	secondary (up to 10 years school)	2	trainee, student	Bavaria	own flat	€1500-2500	no	3-5 years	indifferent, tolerance
3	diverse	30-39	baccalauréat (up to 13 years school)	3	retired	Berlin	rented house	€2500-3600	no idea	5-10 years	positive, accept-ance
4		40-49	university (academic degree)	4	unem-ployed	Branden-burg	rented flat	€3600-5000		>10 years	
5		50-59				Bremen	other	€5000-7000		0=no WP	
6		60-69				Hamburg		>€7000			
7		≥70				Hesse					
8						Mecklenb.-Western Pomerania.					
9						Lower Saxony					
10						North Rhine-Westphalia					
11						Rhineland-Palatinate					
12						Saarland					
13						Saxony					
14						Saxony-Anhalt					
15						Schleswig-Holstein					
16						Thuringia					

A.3.2 Shares of socio-demographic factors

A.3.2.1 Share by socio-demographic factor *gender*

Respondent count per gender

Total	Female	Male	Diverse
2027	965	1061	1
100%	47.61%	52.34%	0%

Share of inhabitants per gender 2021 (Statista Research Departement, 2022b)

Total	Female	Male	Diverse
83 230 000	42 000 000	41 000 000	N/A
100%	50.46%	49.26%	

A.3.2.2 Share by socio-demographic factor *age*

Respondent count per age group

Total	Age group 18-29	Age group 30-39	Age group 40-49	Age group 50-59	Age group 60-69
2027	375	364	388	455	443
100%	18.5%	17.96%	19.14%	22.45%	21.85%

Share of inhabitants per age grouping 2021 (Statista Research Departement, 2022a)

Total	Age group 18-29	Age group 30-39	Age group 40-49	Age group 50-59	Age group 60-69
83 230 000	10 102 796	9 835 575	9 996 703	13 071 909	10 961 974
100%	12.14%	11.82%	12.01%	15.71%	13.17%

A.3.2.3 Share by socio-demographic factor *educational level*

Respondent count per educational level

Total	General Maturity	Intermediate Maturity	A-level	University degree
2027	392	763	368	504
100%	19.34%	37.64%	18.15%	24.86%

Share of inhabitants per educational level (Bundeszentrale für politische Bildung, 2022)

Total	General Maturity	Intermediate Maturity	A-level	University degree
100%	36.1%	30.0%	33.5%	N/A

A.3.2.4 Share by socio-demographic factor *household size*

Respondent count per household size

Total	1 Person household	2 Persons household	3 Persons household	4 Persons (and larger) household
2027	550	1007	284	184
100%	27.13%	49.68%	14.01%	9.08%

Share of inhabitants per household size (Bundeszentrale für politische Bildung, 2021)

Total	1 Person household	2 Persons household	3 Persons household	4 Persons (and larger) household
41 506 000	17 557 000	13 781 000	4 952 000	5 217 000
100%	42.29%	33.2%	11.93%	12.57%

A.3.2.5 Share by socio-demographic factor *occupation*

Respondent count per type of occupation

Total	Employed	Education	Retired	Unemployed
2027	1306	160	389	172
100%	64.43%	7.89%	19.19%	8.49%

Share of inhabitants per type of occupation (Rudnicka, 2022a; Rudnicka, 2022b; Rudnicka, 2022c; Rudnicka, 2022d; Deutsche Rentenversicherung, 2022)

Total	Employed	Education	Retired	Unemployed
83 230 000	45 380 000	1 258 300 (apprenticeship) 2 950 000 (study) Total: 4 208 300	21 223 972	1 280 000
100%	54.52%	5.05%	25.5%	1.54%

A.3.2.6 Share by socio-demographic factor *federal state*

Respondent count per federal state (total n = 2027)

Baden-Württem-berg	Bavaria	Berlin	Branden-burg	Bremen	Hamburg	Hesse	Mecklenburg-Western Pomerania
242	309	111	58	9	70	167	34
11.94%	15.24%	5.48%	2.86%	0.44%	3.45%	8.23%	1.68%
Lower Saxony	**North Rhine-Westphalia**	**Rhineland-Palatinate**	**Saarland**	**Saxony**	**Saxony-Anhalt**	**Schleswig-Holstein**	**Thuringia**
160	425	116	28	113	60	71	54
7.89%	20.97%	5.72%	1.38%	5.57%	2.96%	3.5%	2.66%

A.3.2.7 COUNT-method results

The COUNT-method is a counting method that provides estimates of main effects and side effects for a CBC dataset, by calculating a proportion for each attribute based on how often that attribute was selected within a concept. This is done by dividing the frequency with which the attribute was selected by the frequency with which it is queried. This method of analysis is useful for summarising important relationships, such as the interaction between brand and price (Sawtooth Software, 2017a). This allows to make general statements about the preferences of level combinations.

Count-method report

Burden sharing of ET costs	**Total**
Total Respondents	2027
per capita	0.467
per energy consumption	0.568
Consideration of low-income groups	0.563
Consideration of industry	0.402
D.F.	3
Significance	p < .01
Behavioural changes for the ET	**Total**
Total Respondents	2027
Private PV	0.530
Energy cooperatives	0.480
End devices A++	0.512
Energy-saving behaviour	0.526
Adjust energy consumption	0.467
Political processes	0.485
D.F.	5
Significance	p < .01

Secure Energy Supply	Total
Total Respondents	2027
Worldwide	0.459
EU	0.499
Regional	0.529
Private	0.513
D.F.	3
Significance	$p < .01$
State interventions	**Total**
Total Respondents	2027
Regulations	0.526
Prohibitions	0.432
Appeals and information	0.554
Higher prices	0.488
D.F.	3
Significance	$p < .01$
Proximity to nearest wind park	**Total**
Total Respondents	2027
500 meters	0.473
1000 meters	0.510
5000 meters	0.517
D.F.	2
Significance	$p < .01$
Willingness to pay	**Total**
Total Respondents	2027
+ 2,50 €	0.608
+ 5 €	0.559
+ 10 €	0.470
+ 15 €	0.363
D.F.	3
Significance	$p < .01$

A.3.3 Utility scores per design element

Table 5: Partial utilities of design elements

Attribute Levels	Utility scores	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Burden sharing of ET costs			
per capita	-16.47	-17.48	-15.46
per energy consumption	40.52	38.97	42.06
consideration of low-income groups	33.50	31.94	35.07
consideration of industry	-57.55	-59.42	-55.69
Behavioural changes for the ET			
private PV	22.06	20.77	23.35
energy cooperatives	-13.18	-14.29	-12.06
end devices A++	9.25	8.11	10.39
energy-saving behaviour	16.77	15.72	17.82
adjust energy consumption	-19.88	-20.85	-18.92
political processes	-15.03	-15.96	-14.09
Energy supply form			
worldwide	-27.11	-28.08	-26.14
EU	3.48	2.67	4.30
regional	19.85	18.95	20.75
private	3.78	2.91	4.64
State interventions			
regulation	17.12	16.19	18.05
prohibition	-39.63	-41.63	-37.63
appeals and information	27.08	25.76	28.40
Higher Prices	-4.57	-5.56	-3.57
Proximity to nearest wind farm			
500 meters	-11.58	-13.41	-9.76
1000 meters	2.90	2.00	3.79
5000 meters	8.69	6.91	10.47
Willingness to pay			
+ €2.50	60.72	57.75	63.69
+ €5.00	29.99	28.71	31.27
+ €10.00	-15.06	-16.17	-13.95
+ €15.00	-75.65	-78.68	-72.62

A.3.4 Importance of dimensions and proxies

Table 6: Relevance of dimensions

Attribute	Attribute Importance	Lower 95% Confidence Interval	Upper 95% Confidence Interval
Burden sharing of ET costs	20.23	19.80	20.66
Behavioural changes for the ET	13.61	13.40	13.83
Energy supply form	10.34	10.12	10.56
State interventions	15.36	14.99	15.72
Proximity to nearest wind park	12.14	11.79	12.49
WTP	28.32	27.62	29.02

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