Datenbeschreibung

RWI – Leibniz-Institut für Wirtschaftsforschung

FDZ Data Description: The German Heating and Housing Panel (GHHP) Campus File – Wave 1

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Leibniz Gemeinschaft

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1 Introduction

The FDZ Ruhr provides a campus file for Wave 1 (2021) of the German Heating and Housing Panel (GHHP) – referred to as the **GHHP Campus File**. This dataset is a subset of the Scientific Use File (SUF) and includes 50% of the original GHHP sample, randomly drawn to reflect the population distribution of homeownership in Germany. The Campus File contains the same variables as the SUF, with a few exceptions: several variables were excluded due to redundancy or limited analytical relevance, including all variables from Module 2 and Module 3 (except the PK3 time discounting variables). A full list of excluded variables can be found in **Table 2**.

By collecting data on the building stock, the heating energy costs of private households, acceptance of policy instruments and the socioeconomic characteristics of respondents in repeated systematic surveys conducted as part of the Kopernikus project "Ariadne" funded by the German Federal Ministry of Education and Research, a sound empirical analysis of the heating sector in Germany can be undertaken with the GHHP data. The longitudinal nature of the Ariadne GHHP enables the identification of general trends, such as in modernization activity and household consumption patterns, allowing to analyze barriers to modernizations and more broadly distributional effects of climate change mitigation instruments and public acceptance thereof by household characteristics (Frondel et al. 2021). In addition, the Ariadne GHHP establishes a comprehensive database on the building stock and heating energy consumption of private households.

The Campus File only covers the data from the first wave in 2021. Moreover, due to variable selection and sub-sampling, the size of the Campus data File is significantly smaller than the SUFs, which makes it much easier to work with the data.

This data description provides a brief overview of the data. Since the data is based on the SUFs, we also recommend the data description of the SUFs for more information.

2 Data Collection of Original Data Base

Between July 23 and September 2, 2021, the first survey of the GHHP was conducted as part of the Kopernikus project "Ariadne - Evidence-based Assessment for the Design of the German Energy Transition", funded by the German Federal Ministry of Education and Research (BMBF), see https://ariadneprojekt.de/. The survey was designed by the RWI – Leibniz Institute for Economic Research in cooperation with the project partners Potsdam Institute for Climate Impact Research (PIK) and German Economic Institute. The survey was then conducted in collaboration with the opinion research institute forsa. For the survey, forsa employed its forsa.omninet panel, a panel with approximately 100,000 members. Panel members are recruited as part of forsa.omniTel, a multi-topic telephone survey conducted by forsa in which 500 people are interviewed daily and selected so that the forsa.omninet panel is representative of the German-speaking online population aged 14 and older. The panel members were randomly selected for the survey and invited by a short e-mail. In addition to the link to the questionnaire, the invitation contained a brief introduction to the overarching theme of the survey and stated the (moderate) number of bonus points that participants will receive if they complete the questionnaire in full and can be paid out in the form of vouchers or a raffle ticket from "Aktion Mensch". Alternatively, the amount can be donated to UNICEF.

The sample for the Ariadne GHHP was composed of two subsamples: One subsample consisted of respondents who had previously participated in the "German Residential Energy Consumption Survey" (GRECS) conducted by RWI and forsa, so that the data from the German Heating and Housing Panel can be partially linked to the existing data from GRECS (https://www.rwi-essen.de/forschung-beratung/weitere/forschungsdatenzentrum-ruhr/datenangebot/mikrodaten/rwi-grecs-german-residential-energy-consumption-survey). The other part of the sample was drawn from the general forsa sample "Private households in the Federal Republic of Germany". The survey explicitly targets "heads of households" who are defined as those individuals who typically make the financial decisions for the household. Since heads of household usually also have the best overview of the building stock, energy costs and investments made, they are particularly well suited to answer the survey. As many of the research questions are primarily relevant to owners, they were overweighted in the sample: 64.9% of households surveyed live in owner-occupied properties, while only 35.1% rent. 18.8% of respondents rent a house or apartment. Due to the intentional overweighting of owners, the ownership rate in the sample is significantly higher than that in Germany, which was 46.5% in 2018 according to the Supplementary Microcensus Survey (Destatis 2019). To reach the advised final sample size of 15,000 households, forsa sent the invitation link for the survey to more than 15,000 households from the forsa.omninet panel. With 1,487 abandoned interviews and a response rate of 74.5%, this resulted in a net sample of 15,416 respondents.

The questionnaire consists of several sections (see overview in Table 1). Module 1 collects data on the participants' housing situation and building characteristics. This information can be used to calculate the final energy demand of the building as a measure of energy efficiency. This first section of the questionnaire is followed by a section on households' heating costs and a module on past and planned building retrofits. This information will be asked repeatedly in every survey wave. The query of building characteristics and heating technology is based on the structure of the renovation configurator of the Federal Ministry for Economic Affairs and Energy (BMWK 2015) and the "Short Procedure Energy Profile for the Simple Energy Evaluation of Buildings" of the Institute Living and Environment (Loga et al. 2005) (see also https://www.iwu.de/forschung/energie/kurzverfahren-energieprofil/). In the first survey wave, this module is followed by an experiment on the acceptance of bearing additional costs due to carbon pricing (Module

2). For this purpose, the respondents were randomly divided into three groups that differed in the carbon price level and revenue use information presented to the respondents. A subset of homeowners did not participate in Module 2 but instead participated in an experiment on heating optimization decisions (Module 3). The survey ended with a section on psychological control variables, attitudes towards the environment, time preferences as well as socioeconomic features.

The data for wave 1 is offered in two separate data sets that can be merged via the household identifier "key". The first dataset ("ghhp_w1_buildingchars_eng") contains all building characteristics. All remaining survey data is included in the data set "ghhp_w1_experiments_eng". An accompanying tool to estimate the final energy demand of the respective houses based on their technical characteristics will soon be made available to interested researchers and professionals via RWI.

Table 1
Sections contained in the first wave

Section	Content
a & ist	Building & household characteristics
san	Passed and planned energetic renovations
ea & bel	Energy certificates and beliefs regarding energy retrofits
eg	Experimental groups carbon pricing (Module 2)
co	(Experimental) Assessment of statements about policy measures
es	Experiment on heating optimization decisions (Module 3)
pk & altru	Psychological/environmental control variables
so	Socio-economic data
calc	Calculated values needed for experiment in Module 2

It is important to note that due to the deliberate overweighting of owners, it is not possible to make direct statements representative of the German population based on the data set. For this reason, the data set contains weighting factors calculated by forsa that weight the study representatively according to household size and the ratio of owning vs. renting in the German population. The survey was not designed to infer statistics at the municipal level.

3 The Campus File

The GHHP Campus File represents a 50% subsample of the original GHHP database, selected to reflect the national distribution of homeowners in the German population. Variables were excluded either due to redundancy or because they did not yield analytically relevant information. Table 2 provides a detailed overview of all variables dropped from each section of the sample.

Table 2 **Dropped variables by module**

Section	Dropped Variables	Reason
1. General variables	*dquelle, compl, dely, plz, gemkey*	General metadata, redundant
2. Household and building characteristics	*a1, a5, a7a_1, a7a_2, a8a, ist3, ist4, ist5, ist5a, ist141, ist143, ist144, ist146, ist147, ist149, ist1410, ist1412, ist1413, ist1415, ist1416, ist1418, ist1421, ist1422, ist1423, ist16_1, ist16_2, ist16_3, ist16_4, ist16a_3, ist17_1, ist17_2, ist17_3, ist17_4, ist17_5, ist17_6, ist17_7, ist18, ist19*	Redundancy or lack of analytical value
3. Energy retrofits	*san1_10, san1a_13_5, san1a_23_5, san1a_33_5, san1a_43_5, san1a_53_5, san1a_63_5, san1a_73_5, san1_6a_6, san1_5b, san1b_1, san1b_2, san1b_3, san1b_4, san1a_7a_1, san1a_7a_2, san1a_7a_3, san1a_7a_4, san1a_7a_5, san1a_7a_6, san1a_7b_1*	Redundant or low informational value
4. Beliefs regarding energy retrofits	—	None dropped
5. Experiment on acceptance of CO_2 pricing (Module 2)	*All variables from this module were dropped*	Module excluded
6. Experiment on heating optimization decisions (Module 3)	*All variables from this module were dropped, apart from the PK3 variables related to time discounting*	Module mostly excluded
7. Psychological/environmental attitude variables	—	None dropped
8. Socio-economic data	*so3_12, einv*	Not analytically useful
9. Meta variables	*sms, sys, sds, ems, eys, eds, duration, lfdn, weight0, weight1*	Technical/meta tracking variables

4 Data Access

The data set is available as a Campus Use File at the FDZ Ruhr, the research data center at RWI – Leibniz Institute for Economic Research. The data access does not require a data use agreement. The data can be obtained as a Stata ® dataset (.dta) or csv. file. Interested users should write an email to fdz@rwi-essen.de.

When using the GHHP Campus File, please cite the file as:

Gerster, A., Kaestner, K., Milcetic, M., & Schweers, J. H. (2025). *The German Heating and Housing Panel (GHHP) Campus File - Wave 1* (Version 1) [Data set]. RWI – Leibniz Institute for Economic Research. https://doi.org/10.7807/GHHP:CUF:V1

Furthermore, we recommend citing this data description.

We would also like to draw your attention to the following terms of use. Users must consider the following aspects when using the data:

- The sources mentioned above must be cited correctly.
- The data may only be used within the context of courses and theses. Any further use, especially for commercial purposes, is prohibited.
- Any distribution of the data is strictly prohibited.

The data must be permanently deleted after the approved use has ended. Deletion must be confirmed via email to fdz@rwi-essen.de.

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Appendix: Codebook and Questionnaire

In the following appendix you will find the codebook and the questionnaire.

German Heating and Housing Panel (GHHP) - Wave 1 Codebook

BMBF Kopernikus-Project ARIADNE

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6. Mai 2025

RWI – Leibniz Institute for Economic Research
Essen, Germany

1 General variables

Name of variable: key

Description: Unique identifier

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 0

Name of variable: bland

Description: Federal State

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 0

1 Schleswig-Holstein
2 Hamburg
3 Lower-Saxony
4 Bremen
5 North Rhine Westphalia
6 Hesse
7 Rhineland-Palatine
8 Baden-Wurttemberg
9 Bavaria
10 Saarland
11 Berlin
12 Brandenburg
13 Mecklenburg-Vorpommern
14 Saxony
15 Saxony-Anhalt
16 Thuringia

Name of variable: ges

Description: Gender

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 0

1 Male
2 Female

Name of variable: a1

Description: A1 numeric: Household size

Missings and Encoding:

Don't know/not specified (-1): 19	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6
	7 7
	8 8
	12 12
	13 13
	19 19

Name of variable: a1_num

Description: A1 numeric: Household size

Descriptives:

Min.:	1.00	Max.:	19.00
1. Qu.:	1.00	3. Qu.:	3.00
Mean:	2.15	Median:	2.00

Missings and Encoding:

Don't know/not specified (-1): 19	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6
	7 7
	8 8
	12 12
	13 13
	19 19

Name of variable: a2

Description: Usage type building

Missings and Encoding:

Don't know/not specified (-1): 0	1 Rental
Not asked (-2): 0	2 Property

Name of variable: a2_1a

Description: Landlord type

Missings and Encoding:
Don't know/not specified (-1): 51
Not asked (-2): 3546

1 Private Landlord
2 Private housing company
3 Public housing company
4 Housing association

Name of variable: a4

Description: Building type

Missings and Encoding:
Don't know/not specified (-1): 3
Not asked (-2): 0

1 Detached one-/ two-family house
2 Terraced/semi-detached house
3 Multifamily house (up to 7 floors)
4 High-rise building (8 or more floors)
5 In a (former and/or converted) industry building
6 In a 'Datsche/Datscha', a holiday- or garden house, a caravan or similar
7 In another type of building

Name of variable: a5

Description: a5 numeric: Move-in year

Missings and Encoding:
Don't know/not specified (-1): 37
Not asked (-2): 0

Name of variable: a5_num

Description: a5 numeric: Move-in year

Descriptives:

Min.:	1900.00	Max.:	2021.00
1. Qu.:	1995.00	3. Qu.:	2015.00
Mean:	2003.26	Median:	2007.00

Missings and Encoding:
Don't know/not specified (-1): 37
Not asked (-2): 0

Name of variable: a6

Description: Planned peroiod of residence

Missings and Encoding:

Don't know/not specified (-1): 603	1 Less than a year
Not asked (-2): 0	2 1-2 years
	3 3-5 years
	4 6-10 years
	5 More than 10 years

Name of variable: a7

Description: Renting out apartments and/or houses

Missings and Encoding:

Don't know/not specified (-1): 11	0 No
Not asked (-2): 0	1 Yes

Name of variable: a7a_1

Description: a7a_1 numeric: Number of rented apartments

Missings and Encoding:

Don't know/not specified (-1): 10	0 0
Not asked (-2): 6536	1 1
	2 2
	3 3
	4 4
	5 5
	6 6
	7 7
	8 8
	9 9
	10 10
	11 11
	12 12
	13 13
	15 15
	17 17
	20 20
	23 23
	24 24
	26 26
	29 29
	33 33
	38 38
	40 40
	45 45
	48 48
	50 50

Name of variable: a7a_2

Description: a7a_2 numeric: Number of houses rented out

Missings and Encoding:

Don't know/not specified (-1): 59	0 0
Not asked (-2): 6536	1 1
	2 2
	3 3
	4 4
	5 5
	6 6
	7 7
	11 11
	20 20

Name of variable: a7a_1_num

Description: a7a_1 numeric: Number of rented apartments

Descriptives:

Min.:	0.00	Max.:	50.00
1. Qu.:	1.00	3. Qu.:	2.00
Mean:	2.44	Median:	1.00

Missings and Encoding:

Don't know/not specified (-1): 10
Not asked (-2): 6536

0 0
1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 10
11 11
12 12
13 13
15 15
17 17
20 20
23 23
24 24
26 26
29 29
33 33
38 38
40 40
45 45
48 48
50 50

Name of variable: a7a_2_num

Description: a7a_2 numeric: Number of houses rented out

Descriptives:

Min.:	0.00	Max.:	20.00
1. Qu.:	0.00	3. Qu.:	1.00
Mean:	0.40	Median:	0.00

Missings and Encoding:

Don't know/not specified (-1): 59	0 0
Not asked (-2): 6536	1 1
	2 2
	3 3
	4 4
	5 5
	6 6
	7 7
	11 11
	20 20

Name of variable: a8

Description: Owns second/holiday-apartment/-house

Missings and Encoding:

Don't know/not specified (-1): 11	1 No
Not asked (-2): 0	2 Yes, second apartment/house
	3 Yes, holiday apartment/-house/-haus
	4 Yes, both

Name of variable: a8a

Description: a8a numeric: Number of months in primary residence

Missings and Encoding:

Don't know/not specified (-1): 14	1 1
Not asked (-2): 7177	2 2
	3 3
	4 4
	5 5
	6 6
	7 7
	8 8
	9 9
	10 10
	11 11
	12 12

Name of variable: a8a_num

Description: a8a numeric: Number of months in primary residence

Descriptives:

Min.:	1.00	Max.:	12.00
1. Qu.:	10.00	3. Qu.:	12.00
Mean:	9.97	Median:	11.00

Missings and Encoding:

Don't know/not specified (-1): 14
Not asked (-2): 7177

1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 10
11 11
12 12

Name of variable: ist1

Description: Adjacency to other buildings

Missings and Encoding:

Don't know/not specified (-1): 15
Not asked (-2): 0

1 Detached building, i.e. no directly adjacent buildings
2 On one side directly adjacent neighbouring building
3 On two sides directly adjacent neighbouring buildings

Name of variable: ist2

Description: Floor plan

Missings and Encoding:

Don't know/not specified (-1): 37
Not asked (-2): 0

1 Compact
2 Elongated, angled or more complicated

Name of variable: ist3

Description: Number of residential units numeric

Missings and Encoding:
Don't know/not specified (-1): 107
Not asked (-2): 0

Name of variable: ist3_num

Description: Number of residential units numeric

Descriptives:

Min.:	1.00	Max.:	50.00
1. Qu.:	1.00	3. Qu.:	8.00
Mean:	6.81	Median:	3.00

Missings and Encoding:
Don't know/not specified (-1): 107
Not asked (-2): 0

Name of variable: ist4

Description: ist4 numeric: Number of floors (without basement and attic)

Missings and Encoding:
Don't know/not specified (-1): 48
Not asked (-2): 0

1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 10
11 11
12 12
13 13
14 14
15 15
16 16
17 17
18 18
19 19
20 20
21 21
30 30

Name of variable: ist4_num

Description: ist4 numeric: Number of floors (without basement and attic)

Descriptives:

Min.:	1.00	Max.:	30.00
1. Qu.:	2.00	3. Qu.:	3.00
Mean:	2.86	Median:	2.00

Missings and Encoding:

Don't know/not specified (-1): 48
Not asked (-2): 0

1 1
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 10
11 11
12 12
13 13
14 14
15 15
16 16
17 17
18 18
19 19
20 20
21 21
30 30

Name of variable: ist5a

Description: ist5a numeric: Size of heated living space of entire building (m^2)(*withouthea*

Missings and Encoding:

Don't know/not specified (-1): 111
Not asked (-2): 6123

Name of variable: ist5_num

Description: ist5 numeric: Size of heated living space in house/apartment (without heated bas

Descriptives:

Min.:	3.00	Max.:	960.00
1. Qu.:	72.00	3. Qu.:	133.00
Mean:	109.85	Median:	100.00

Missings and Encoding:
Don't know/not specified (-1): 125
Not asked (-2): 0

Name of variable: ist5a_num

Description: ist5a numeric: Size of heated living space of entire building (m^2)(*withouthea*

Descriptives:

Min.:	12.00	Max.:	4620.00
1. Qu.:	150.00	3. Qu.:	250.00
Mean:	232.91	Median:	200.00

Missings and Encoding:
Don't know/not specified (-1): 111
Not asked (-2): 6123

Name of variable: ist6

Description: Year of construction of building

Missings and Encoding:
Don't know/not specified (-1): 400
Not asked (-2): 0

1 Until 1918
2 1919-1948
3 1949-1957
4 1958-1968
5 1969-1978
6 1979-1983
7 1984-1994
8 1995-2001
9 2002-2004
10 2005-2006
11 2007-2008
12 2009-2013
13 2014-2015
14 2016-2019
15 As of 2020

Name of variable: ist7

Description: Roof shape

Missings and Encoding:

Don't know/not specified (-1): 37	1 Pitched roof
Not asked (-2): 0	2 Flat roof or flat pitched roof

Name of variable: ist7_1a

Description: Heated attic

Missings and Encoding:

Don't know/not specified (-1): 196	1 Attic completely heated
Not asked (-2): 1565	2 Attic partly heated
	3 Attic unheated

Name of variable: ist7_1b

Description: Dormer windows and other roof structures

Missings and Encoding:

Don't know/not specified (-1): 245	0 No dormer windows and other roof structures
Not asked (-2): 1565	1 Dormer windows and other roof structures

---

Name of variable: ist8

Description: Heated basement

Missings and Encoding:

Don't know/not specified (-1): 144	1 Fully heated basement
Not asked (-2): 0	2 Partly heated basement
	3 Unheated basement
	4 No basement

Name of variable: ist9_1

Description: Roof construction

Missings and Encoding:

Don't know/not specified (-1): 651
Not asked (-2): 0

1 Massive (e.g. masonry walls, concrete walls and ceilings)
2 Wood (e.g. wooden beam ceilings, wooden beam roof trusses, half-timbered or prefabricated wooden house walls)

Name of variable: ist9_2

Description: Construction top floor ceiling

Missings and Encoding:

Don't know/not specified (-1): 376
Not asked (-2): 1565

1 Massive (e.g. masonry walls, concrete walls and ceilings)
2 Wood (e.g. wooden beam ceilings, wooden beam roof trusses, half-timbered or prefabricated wooden house walls)

Name of variable: ist9_3

Description: Construction exterior walls

Missings and Encoding:

Don't know/not specified (-1): 105
Not asked (-2): 0

1 Massive (e.g. masonry walls, concrete walls and ceilings)
2 Wood (e.g. wooden beam ceilings, wooden beam roof trusses, half-timbered or prefabricated wooden house walls)

Name of variable: ist9_4

Description: Construction basement ceiling/floor to the ground (if there is no basement)

Missings and Encoding:

Don't know/not specified (-1): 369
Not asked (-2): 0

1 Massive (e.g. masonry walls, concrete walls and ceilings)
2 Wood (e.g. wooden beam ceilings, wooden beam roof trusses, half-timbered or prefabricated wooden house walls)

Name of variable: ist10

Description: Year of installation of current windows

Missings and Encoding:

Don't know/not specified (-1): 920
Not asked (-2): 0

1 Until 1918
2 1919-1948
3 1949-1957
4 1958-1968
5 1969-1978
6 1979-1983
7 1984-1994
8 1995-2001
9 2002-2004
10 2005-2006
11 2007-2008
12 2009-2013
13 2014-2015
14 2016-2019
15 As of 2020

Name of variable: ist11

Description: Predominant glazing of windows

Missings and Encoding:

Don't know/not specified (-1): 145
Not asked (-2): 0

1 Windows single glazed
2 Wooden windows with double glazing
3 Plastic windows with double glazing
4 Aluminum windows with double glazing
5 Windows with triple glazing

Name of variable: ist12

Description: Predominant heating system

Missings and Encoding:

Don't know/not specified (-1): 303
Not asked (-2): 0

1 Boiler/heater (central)
2 Heat pump (central)
3 District/local heating (central)
4 Apartment-by-apartment heating (supplying individual residential units with their own energy generator, e.g., gas floor heating)
5 Room-by-room heating (supplying individual rooms, e.g., with night storage heaters)

Name of variable: ist12a

Description: Decision-making in the house in terms of central heating system

Missings and Encoding:

Don't know/not specified (-1): 18	1 Residents of own apartment (e.g. yourself)
Not asked (-2): 6501	2 Residents of other apartments
	3 Residents of own apartment together with residents of other apartments
	4 Real estate company
	5 Public sector
	6 Housing cooperative

Name of variable: ist12_1a

Description: Central heating fuel

Missings and Encoding:

Don't know/not specified (-1): 116	1 Natural gas
Not asked (-2): 3309	2 Liquid gas
	3 Heating oil
	4 Logs/pellets
	5 Other

Name of variable: ist12_2a

Description: Type of heat generation of heat pump

Missings and Encoding:

Don't know/not specified (-1): 143	1 Alone, so only heat pump
Not asked (-2): 7158	2 Heat pump with heating rod
	3 Heat pump with boiler
	4 Heating rod only

Name of variable: ist12_2b

Description: Heat source of heat pump

Missings and Encoding:

Don't know/not specified (-1): 163	1 Outside air
Not asked (-2): 7158	2 Ground/groundwater

Name of variable: ist12_3a

Description: District heating / local heating supply

Missings and Encoding:

Don't know/not specified (-1): 586	1 Boiler/heating plant (heat generation only)
Not asked (-2): 6332	2 Combined heat and power (CHP) plant primarily for electricity generation (e.g., cogeneration plant, heat share less than 503 Combined heat and power (CHP) plant primarily for heat generation (heat share greater than 504 Other

---

Name of variable: ist12_5a

Description: Type of space heating for room-by-room heating

Missings and Encoding:

Don't know/not specified (-1): 4	1 Individual furnaces with heating oil
Not asked (-2): 7494	2 Individual furnaces with coal
	3 Individual furnaces with wood
	4 Gas space heaters
	5 Electric heaters or night storage

Name of variable: ist13

Description: Commissioning year of heating system

Missings and Encoding:

Don't know/not specified (-1): 1597	1 Until 1978
Not asked (-2): 0	2 1979-1982
	3 1983-1986
	4 1987-1989
	5 1990-1994
	6 1995-1999
	7 2000-2001
	8 2002-2004
	9 2005-2006
	10 2007-2008
	11 2009-2013
	12 2014-2015
	13 2016-2019
	14 As of 2020

Name of variable: ist13a

Description: Insulation of heating distribution pipes

Missings and Encoding:

Don't know/not specified (-1): 1103	0 No
Not asked (-2): 2418	1 Yes

Name of variable: ist13a_1

Description: Year of insulation of distribution pipes

Missings and Encoding:

Don't know/not specified (-1): 443
Not asked (-2): 4287

1 Before 1977
2 Between 1977 and 2001
3 As of 2002

Name of variable: ist14

Description: Type of hot water supply

Missings and Encoding:

Don't know/not specified (-1): 536
Not asked (-2): 0

1 Combined with central heating
2 Central gas storage water heater
3 Central electric storage
4 Basement air/exhaust air heat pump
5 Gas floor heating
6 Instantaneous gas water heater
7 Instantaneous electric water heater
8 Electric storage/small storage

Name of variable: ist14a

Description: Commissioning year of hot water supply device

Missings and Encoding:

Don't know/not specified (-1): 468
Not asked (-2): 5789

1 Until 1978
2 1979-1982
3 1983-1986
4 1987-1989
5 1990-1994
6 1995-1999
7 2000-2001
8 2002-2004
9 2005-2006
10 2007-2008
11 2009-2013
12 2014-2015
13 2016-2019
14 As of 2020

Name of variable: ist14b

Description: Hot water circulation

Missings and Encoding:

Don't know/not specified (-1): 1096	1 Without hot water circulation
Not asked (-2): 2455	2 With hot water circulation

Name of variable: ist14c

Description: Insulation of hot water pipes

Missings and Encoding:

Don't know/not specified (-1): 928	0 No
Not asked (-2): 3539	1 Yes

Name of variable: ist14c_1a

Description: Year of insulation of hot water pipes

Missings and Encoding:

Don't know/not specified (-1): 229	1 Before 1977
Not asked (-2): 5346	2 Between 1977 and 2001
	3 As of 2002

Name of variable: ist15_1

Description: Insulation of roof

Missings and Encoding:

Don't know/not specified (-1): 1837	1 Not at all
Not asked (-2): 0	2 Somewhat (about 1/4 of the area)
	3 About half
	4 Mostly (about 3/4 of the area)
	5 Completely

Name of variable: ist15_2

Description: Insulation of top floor ceiling

Missings and Encoding:

Don't know/not specified (-1): 1504
Not asked (-2): 1565

1 Not at all
2 Somewhat (about 1/4 of the area)
3 About half
4 Mostly (about 3/4 of the area)
5 Completely

Name of variable: ist15_3

Description: Insulation of exterior walls

Missings and Encoding:

Don't know/not specified (-1): 1463
Not asked (-2): 0

1 Not at all
2 Somewhat (about 1/4 of the area)
3 About half
4 Mostly (about 3/4 of the area)
5 Completely

Name of variable: ist15_4

Description: Insulation of the basement ceiling/floor to ground (if no basement)

Missings and Encoding:

Don't know/not specified (-1): 2486
Not asked (-2): 0

1 Not at all
2 Somewhat (about 1/4 of the area)
3 About half
4 Mostly (about 3/4 of the area)
5 Completely

Name of variable: ist16

Description: Photovoltaic and/or solar thermal system

Missings and Encoding:

Don't know/not specified (-1): 105
Not asked (-2): 0

1 Solar thermal system
2 Photovoltaic system
3 Solar thermal and photovoltaic system
4 Neither

Name of variable: ist16a_1

Description: Solar thermal system used for heating

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6991	1 Yes

Name of variable: ist16a_2

Description: Solar thermal system used for warm water

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6991	1 Yes

Name of variable: ist17

Description: Connection for energy sources options at property

Missings and Encoding:

Don't know/not specified (-1): 122	1 Gas connection
Not asked (-2): 4162	2 No gas connection, but street has gas pipeline
	3 Street has no gas pipeline
	4 District heating connection
	5 No district heating connection, but street has district heating pipeline
	6 Street has no district heating pipeline
	7 Gas and district heating connection
	8 Gas-, but no district heating connection
	9 Gas, but no district heating connection, where street has district heating pipe
	10 District heating, but no gas connection, where street has gas pipe
	11 District heating connection, but street has no gas pipe

Name of variable: ist18_num

Description: Ist18 numeric - heating and warm water monthly advance payment - tenant

Descriptives:

Min.:	0.00	Max.:	900.00
1. Qu.:	63.00	3. Qu.:	150.00
Mean:	113.68	Median:	100.00

Missings and Encoding:
Don't know/not specified (-1): 733
Not asked (-2): 3546

Name of variable: ist18_1a

Description: Use of invoice/rental contract for specifying monthly heating and hot water cost

Missings and Encoding:
Don't know/not specified (-1): 9
Not asked (-2): 4279

0 No
1 Yes

Name of variable: ist18_1b

Description: Certainty in estimating monthly advance payment (tenant)

Missings and Encoding:
Don't know/not specified (-1): 8
Not asked (-2): 5468

1 Very uncertain
2 Uncertain
3 Neither certain not certain
4 Certain
5 Very certain

Name of variable: ist19_num

Description: ist19 numeric: Annual heating and hot water costs (homeowner)

Descriptives:

Min.:	0.00	Max.:	9000.00
1. Qu.:	900.00	3. Qu.:	1800.00
Mean:	1412.78	Median:	1200.00

Missings and Encoding:
Don't know/not specified (-1): 620
Not asked (-2): 4162

Name of variable: ist19_1a

Description: Use of invoice for specifying annual heating and hot water costs (homeowner)

Missings and Encoding:

Don't know/not specified (-1): 5	0 No
Not asked (-2): 4782	1 Yes

Name of variable: ist19_1b

Description: Certainty in estimating annual heating and hot water costs (homeowner)

Missings and Encoding:

Don't know/not specified (-1): 2	1 Very uncertain
Not asked (-2): 5907	2 Uncertain
	3 Neither certain not certain
	4 Certain
	5 Very certain

---

2 Energy Retrofits

Name of variable: san1_1

Description: Insulation of roof since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_2

Description: Insulation of top floor ceiling since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_3

Description: Insulation of exterior walls (incl. basement walls) since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_4

Description: Insulation of basement ceiling/floor to ground (if no basement) since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_5

Description: Renovation of windows since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_6

Description: Optimization of existing heating system since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_7

Description: Installation of new equipment for heat generation since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_8

Description: Other modernization measures since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1_9

Description: No modernization measure carried out since 2000

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san1a_11

Description: Newly applied insulation of roof: Start of implementation

Missings and Encoding:

Don't know/not specified (-1): 317	1 2000
Not asked (-2): 6385	2 2001
	3 2002
	4 2003
	5 2004
	6 2005
	7 2006
	8 2007
	9 2008
	10 2009
	11 2010
	12 2011
	13 2012
	14 2013
	15 2014
	16 2015
	17 2016
	18 2017
	19 2018
	20 2019
	21 2020
	22 2021

Name of variable: san1a_21

Description: Newly applied insulation of top floor ceiling: Start of implementation

Missings and Encoding:

Don't know/not specified (-1): 172
Not asked (-2): 7010

1 2000
2 2001
3 2002
4 2003
5 2004
6 2005
7 2006
8 2007
9 2008
10 2009
11 2010
12 2011
13 2012
14 2013
15 2014
16 2015
17 2016
18 2017
19 2018
20 2019
21 2020
22 2021

Name of variable: san1a_31

Description: Newly applied insulation of exterior walls: Start of implementation

Missings and Encoding:

Don't know/not specified (-1): 313
Not asked (-2): 6684

1 2000
2 2001
3 2002
4 2003
5 2004
6 2005
7 2006
8 2007
9 2008
10 2009
11 2010
12 2011
13 2012
14 2013
15 2014
16 2015
17 2016
18 2017
19 2018
20 2019
21 2020
22 2021

Name of variable: san1a_41

Description: Newly applied insulation of basement ceiling/floor to the ground (if no basement

Missings and Encoding:

Don't know/not specified (-1): 121
Not asked (-2): 7316

1 2000
2 2001
3 2002
4 2003
5 2004
6 2005
7 2006
8 2007
9 2008
10 2009
11 2010
12 2011
13 2012
14 2013
15 2014
16 2015
17 2016
18 2017
19 2018
20 2019
21 2020
22 2021

Name of variable: san1a_51

Description: Renovation of windows: Start of implementation

Missings and Encoding:

Don't know/not specified (-1): 586
Not asked (-2): 5363

1 2000
2 2001
3 2002
4 2003
5 2004
6 2005
7 2006
8 2007
9 2008
10 2009
11 2010
12 2011
13 2012
14 2013
15 2014
16 2015
17 2016
18 2017
19 2018
20 2019
21 2020
22 2021

Name of variable: san1a_61

Description: Optimization of heating system: Start of implementation

Missings and Encoding:

Don't know/not specified (-1): 353
Not asked (-2): 6202

1 2000
2 2001
3 2002
4 2003
5 2004
6 2005
7 2006
8 2007
9 2008
10 2009
11 2010
12 2011
13 2012
14 2013
15 2014
16 2015
17 2016
18 2017
19 2018
20 2019
21 2020
22 2021

Name of variable: san1a_71

Description: Installation of new equipment for heat generation: Start of implementation

Missings and Encoding:

Don't know/not specified (-1): 549
Not asked (-2): 5438

1 2000
2 2001
3 2002
4 2003
5 2004
6 2005
7 2006
8 2007
9 2008
10 2009
11 2010
12 2011
13 2012
14 2013
15 2014
16 2015
17 2016
18 2017
19 2018
20 2019
21 2020
22 2021

Name of variable: san1a_12

Description: Newly applied insulation of roof: Cost

Missings and Encoding:

Don't know/not specified (-1): 647
Not asked (-2): 6385

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
8 30.000 - below 40.000 Euro
9 40.000 - below 60.000 Euro
10 60.000 Euro or more

Name of variable: san1a_22

Description: Newly applied insulation of top floor ceiling: Cost

Missings and Encoding:

Don't know/not specified (-1): 380
Not asked (-2): 7010

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
8 30.000 - below 40.000 Euro
9 40.000 - below 60.000 Euro
10 60.000 Euro or more

Name of variable: san1a_32

Description: Newly applied insulation of exterior walls: Cost

Missings and Encoding:

Don't know/not specified (-1): 656
Not asked (-2): 6684

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
8 30.000 - below 40.000 Euro
9 40.000 - below 60.000 Euro
10 60.000 Euro or more

Name of variable: san1a_42

Description: Newly applied insulation of basement ceiling/floor to the ground (if no basement

Missings and Encoding:

Don't know/not specified (-1): 257
Not asked (-2): 7316

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
10 60.000 Euro or more

Name of variable: san1a_52

Description: Renovation of windows: Cost

Missings and Encoding:

Don't know/not specified (-1): 1168
Not asked (-2): 5363

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
8 30.000 - below 40.000 Euro
9 40.000 - below 60.000 Euro
10 60.000 Euro or more

Name of variable: san1a_62

Description: Optimization of heating system: Cost

Missings and Encoding:

Don't know/not specified (-1): 647
Not asked (-2): 6202

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
8 30.000 - below 40.000 Euro
9 40.000 - below 60.000 Euro
10 60.000 Euro or more

Name of variable: san1a_72

Description: Installation of new equipment for heat generation: Cost

Missings and Encoding:

Don't know/not specified (-1): 983
Not asked (-2): 5438

1 below 1.000 Euro
2 1.000 - below 3.000 Euro
3 3.000 - below 5.000 Euro
4 5.000 - below 10.000 Euro
5 10.000 - below 15.000 Euro
6 15.000 - below 20.000 Euro
7 20.000 - below 30.000 Euro
8 30.000 - below 40.000 Euro
9 40.000 - below 60.000 Euro
10 60.000 Euro or more

Name of variable: san1a_13_1

Description: Newly applied insulation of roof: Funding by the Federal Office of Economics and

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6385	1 Yes

Name of variable: san1a_13_2

Description: Newly applied insulation of roof: Credit Institute for Reconstruction (KfW) fund

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6385	1 Yes

Name of variable: san1a_13_3

Description: Newly applied insulation of roof: Other funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6385	1 Yes

Name of variable: san1a_13_4

Description: Newly applied insulation of roof: No funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6385	1 Yes

Name of variable: san1a_23_1

Description: Newly applied insulation of top floor ceiling: Funding from the Federal Office o

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7010	1 Yes

Name of variable: san1a_23_2

Description: Newly applied insulation of top floor ceiling: Credit Institute for Reconstructi

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7010	1 Yes

Name of variable: san1a_23_3

Description: Newly applied insulation of top floor ceiling: Other funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7010	1 Yes

Name of variable: san1a_23_4

Description: No funding: Newly applied insulation of top floor ceiling

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7010	1 Yes

Name of variable: san1a_33_1

Description: Newly applied insulation of exterior walls: Funding from the Federal Office of E

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6684	1 Yes

Name of variable: san1a_33_2

Description: Newly applied insulation of exterior walls: Credit Institute for Reconstruction

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6684	1 Yes

Name of variable: san1a_33_3

Description: Newly applied insulation of exterior walls: Other funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6684	1 Yes

Name of variable: san1a_33_4

Description: Newly applied insulation of exterior walls: No funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6684	1 Yes

Name of variable: san1a_43_1

Description: Newly applied insulation of basement ceiling/floor to the ground (if no basement

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7316	1 Yes

Name of variable: san1a_43_2

Description: Newly applied insulation of basement ceiling/floor to the ground (if no basement

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7316	1 Yes

Name of variable: san1a_43_3

Description: Newly applied insulation of basement ceiling/floor to the ground (if no basement

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7316	1 Yes

Name of variable: san1a_43_4

Description: Newly applied insulation of basement ceiling/floor to the ground (if no basement

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 7316	1 Yes

Name of variable: san1a_53_1

Description: Renovation of windows: Subsidy from the Federal Office of Economics and Export C

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5363	1 Yes

Name of variable: san1a_53_2

Description: Renovation of windows: KfW funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5363	1 Yes

Name of variable: san1a_53_3

Description: Renovation of windows: Other funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5363	1 Yes

Name of variable: san1a_53_4

Description: Renovation of windows: No funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5363	1 Yes

Name of variable: san1a_63_1

Description: Optimization of heating system: Funding by the Federal Office of Economics and E

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6202	1 Yes

Name of variable: san1a_63_2

Description: Optimization of heating system: KfW funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6202	1 Yes

Name of variable: san1a_63_3

Description: Optimization of heating system: Other funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6202	1 Yes

Name of variable: san1a_63_4

Description: Optimization of heating system: No funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6202	1 Yes

Name of variable: san1a_73_1

Description: New heat generation equipment: Subsidy from the Federal Office of Economics and

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5438	1 Yes

Name of variable: san1a_73_2

Description: New heat generation equipment: KfW funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5438	1 Yes

Name of variable: san1a_73_3

Description: New heat generation equipment: Other funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5438	1 Yes

Name of variable: san1a_73_4

Description: New heat generation equipment: No funding

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 5438	1 Yes

Name of variable: san1a_1a

Description: Implementation of modernization measures as a complete refurbishment in the cour

Missings and Encoding:

Don't know/not specified (-1): 101	1 Yes, as KfW-Efficiency-house 55
Not asked (-2): 7193	2 Yes, as KfW-Efficiency-house 70
	3 Yes, as KfW-Efficiency-house 85
	4 Yes, as KfW-Efficiency-house 100
	5 Yes, as KfW-Efficiency-house 115
	6 No, as a single measure

Name of variable: san1_5a

Description: Year of installation windows before renovation

Missings and Encoding:

Don't know/not specified (-1): 453	1 Until 1918
Not asked (-2): 5362	2 1919-1948
	3 1949-1957
	4 1958-1968
	5 1969-1978
	6 1979-1983
	7 1984-1994
	8 1995-2001
	9 2002-2004
	10 2005-2006
	11 2007-2008
	12 2009-2013
	13 2014-2015
	14 2016-2019
	15 As of 2020

Name of variable: san1_6a_1

Description: San1_6a: Insulation of heating piping according to energy saving regulation EnEV

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6307	1 Yes

Name of variable: san1_6a_2

Description: San1_6a: Insulation of the hot water distribution pipes according to energy savi

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6307	1 Yes

Name of variable: san1_6a_3

Description: San1_6a: Installation of a high-efficiency pump

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6307	1 Yes

Name of variable: san1_6a_4

Description: San1_6a: Implementation of a hydraulic balancing

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 6307	1 Yes

Name of variable: san1_7a_1

Description: San1_7a: Newly built in/replaced boiler/Heater (central)

Missings and Encoding:

Don't know/not specified (-1): 187	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_2

Description: San1_7a: Newly built in/replaced electric heat pump/exhaust air heat pump

Missings and Encoding:

Don't know/not specified (-1): 301	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_3

Description: San1_7a: Newly built in/replaced solar thermal system

Missings and Encoding:

Don't know/not specified (-1): 166	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_4

Description: San1_7a: Newly built in/replaced gas instantaneous water heater

Missings and Encoding:

Don't know/not specified (-1): 232	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_5

Description: San1_7a: Newly built in/replaced electric instantaneous water heater

Missings and Encoding:

Don't know/not specified (-1): 217	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_6

Description: San1_7a: Newly built in/replaced electric storage tank/small storage tank for wa

Missings and Encoding:

Don't know/not specified (-1): 249	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_7

Description: San1_7a: Newly built in/replaced first connection to district heating network or

Missings and Encoding:

Don't know/not specified (-1): 220	1 Newly built in
Not asked (-2): 5438	3 Not applicable

Name of variable: san1_7a_1

Description: San1_7a: Newly built in/replaced boiler/Heater (central)

Missings and Encoding:

Don't know/not specified (-1): 187	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_2

Description: San1_7a: Newly built in/replaced electric heat pump/exhaust air heat pump

Missings and Encoding:

Don't know/not specified (-1): 301	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_3

Description: San1_7a: Newly built in/replaced solar thermal system

Missings and Encoding:

Don't know/not specified (-1): 166	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_4

Description: San1_7a: Newly built in/replaced gas instantaneous water heater

Missings and Encoding:

Don't know/not specified (-1): 232	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_5

Description: San1_7a: Newly built in/replaced electric instantaneous water heater

Missings and Encoding:

Don't know/not specified (-1): 217	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7a_6

Description: San1_7a: Newly built in/replaced electric storage tank/small storage tank for wa

Missings and Encoding:

Don't know/not specified (-1): 249	1 Newly built in
Not asked (-2): 5438	2 Replaced
	3 Not applicable

Name of variable: san1_7b

Description: Purpose of new installation of heat generating device

Missings and Encoding:

Don't know/not specified (-1): 25	1 Only for heating
Not asked (-2): 5855	2 Only for warm water
	3 For heating and warm water

Name of variable: san2

Description: Use of energy consulting since 2000

Missings and Encoding:

Don't know/not specified (-1): 848	0 No
Not asked (-2): 0	1 Yes

Name of variable: san2a

Description: Timing of energy consulting

Missings and Encoding:

Don't know/not specified (-1): 85	1 2000-2010
Not asked (-2): 7034	2 2011-2021

Name of variable: san2a_num

Description: Timing of energy consulting - numeric

Descriptives:

Min.:	2000.00	Max.:	2021.00
1. Qu.:	2010.00	3. Qu.:	2019.00
Mean:	2013.49	Median:	2015.00

Missings and Encoding:

Don't know/not specified (-1): 85	2000 2000
Not asked (-2): 7034	2001 2001
	2002 2002
	2003 2003
	2004 2004
	2005 2005
	2006 2006
	2007 2007
	2008 2008
	2009 2009
	2010 2010
	2011 2011
	2012 2012
	2013 2013
	2014 2014
	2015 2015
	2016 2016
	2017 2017
	2018 2018
	2019 2019
	2020 2020
	2021 2021

Name of variable: san3_1

Description: Planned insulation of roof by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_2

Description: Planned insulation of the top floor ceiling by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_3

Description: Planned insulation of exterior wall (incl. basement wall) by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_4

Description: Planned insulation of basement ceiling/floor to ground by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_5

Description: Planned renovation of windows by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_6

Description: Planned optimization of existing heating system by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_7

Description: Planned installation of new equipment for heat generation by 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3_8

Description: Other planned modernizations until 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: san3_9

Description: No modernization measure planned until 2030

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 220	1 Yes

Name of variable: san3a

Description: Implementation of the planned measure by 2030 in the course of a KfW Efficiency

Missings and Encoding:

Don't know/not specified (-1): 827	1 Yes, as KfW-Efficiency-house 55
Not asked (-2): 5517	2 Yes, as KfW-Efficiency-house 70
	3 Yes, as KfW-Efficiency-house 85
	4 Yes, as KfW-Efficiency-house 100
	5 Yes, as KfW-Efficiency-house 115
	6 No, as a single measure

Name of variable: san4_1

Description: Agreement: The heating energy consumption in my residential building can be sign

Missings and Encoding:

Don't know/not specified (-1): 646	1 Don't agree at all
Not asked (-2): 0	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_2

Description: Agreement: Energy costs in Germany are high

Missings and Encoding:

Don't know/not specified (-1): 327	1 Don't agree at all
Not asked (-2): 0	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_3

Description: Agreement: Heating energy costs for private households will rise in the future

Missings and Encoding:

Don't know/not specified (-1): 0	1 Don't agree at all
Not asked (-2): 0	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_4

Description: Agreement: Energy consulting is necessary for me to make renovation decisions

Missings and Encoding:

Don't know/not specified (-1): 204	1 Don't agree at all
Not asked (-2): 4162	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_5

Description: Agreement: I can't afford energy renovations

Missings and Encoding:

Don't know/not specified (-1): 199	1 Don't agree at all
Not asked (-2): 4162	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_6

Description: Agreement: Even with government incentive programs, energy retrofits don't pay o

Missings and Encoding:

Don't know/not specified (-1): 449	1 Don't agree at all
Not asked (-2): 4162	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_7

Description: Agreement: I am well informed about possible energy renovation measures on my re

Missings and Encoding:

Don't know/not specified (-1): 159	1 Don't agree at all
Not asked (-2): 4162	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: san4_8

Description: Agreement: I am well-informed about government funding programs for renovation p

Missings and Encoding:

Don't know/not specified (-1): 166	1 Don't agree at all
Not asked (-2): 4162	2 Don't agree
	3 Neither agree nor disagree
	4 Agree
	5 Agree completely

Name of variable: ea1

Description: Receipt of energy certificate when renting the apartment

Missings and Encoding:

Don't know/not specified (-1): 314	0 No
Not asked (-2): 3546	1 Yes

Name of variable: ea2

Description: Has energy certificate for current residential building

Missings and Encoding:

Don't know/not specified (-1): 243	0 No
Not asked (-2): 4162	1 Yes

Name of variable: ea2_1

Description: Type of energy certificate

Missings and Encoding:

Don't know/not specified (-1): 277	1 Demand certificate
Not asked (-2): 6812	2 Consumption certificate

---

3 Beliefs regarding energy retrofits

Name of variable: bel1

Description:

Missings and Encoding:

Don't know/not specified (-1): 4516	1 0
Not asked (-2): 0	2 1-30
	3 31-50
	4 51-75
	5 76-100
	6 101-130
	7 131-160
	8 161-200
	9 201-250
	10 251 or more

Name of variable: bel1_num

Description: Estimate of current final energy demand of the residential building, in kWh/(m2*

Missings and Encoding:
Don't know/not specified (-1): 4516
Not asked (-2): 0

Name of variable: bel2_1

Description: Ranking position complete insulation of the roof/top floor ceiling for energy sa

Missings and Encoding:

Don't know/not specified (-1): 3105	1 1
Not asked (-2): 1565	2 2
	3 3
	4 4
	5 5
	6 6

Name of variable: bel2_2

Description: Ranking position complete insulation of the outer wall (including basement wall)

Missings and Encoding:

Don't know/not specified (-1): 4026	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6

Name of variable: bel2_3

Description: Ranking position complete insulation of the basement ceiling/floor to the ground

Missings and Encoding:

Don't know/not specified (-1): 4026	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6

Name of variable: bel2_4

Description: Ranking position installation of windows with triple glazing for energy saving

Missings and Encoding:

Don't know/not specified (-1): 4026	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6

Name of variable: bel2_5

Description: Ranking position installation of a modern central heating system for energy savi

Missings and Encoding:

Don't know/not specified (-1): 4026	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6

Name of variable: bel2_6

Description: Ranking position optimization of the existing heating system for energy saving

Missings and Encoding:

Don't know/not specified (-1): 4026	1 1
Not asked (-2): 0	2 2
	3 3
	4 4
	5 5
	6 6

4 Module 3: Experiment on heating optimization decisions (owner II)

Name of variable: pk3_1

Description: Would you rather receive 100 Euro today or 154 Euro in 12 months?

Missings and Encoding:

Don't know/not specified (-1): 151	1 100 Euros today
Not asked (-2): 0	2 154 Euros in 12 months

Name of variable: pk3_2

Description: Would you rather receive 100 Euro today or [PK3X2X] Euro in 12 months?

Missings and Encoding:

Don't know/not specified (-1): 173	1 100 Euros today
Not asked (-2): 0	2 [PK3X2X] Euros in 12 months

Name of variable: pk3_3

Description: Would you rather receive 100 Euro today or [PK3X3X] Euro in 12 months?

Missings and Encoding:

Don't know/not specified (-1): 211	1 100 Euros today
Not asked (-2): 0	2 [PK3X3X] Euros in 12 months

Name of variable: pk3_4

Description: Would you rather receive 100 Euro today or [PK3X4X] Euro in 12 months?

Missings and Encoding:

Don't know/not specified (-1): 259	1 100 Euros today
Not asked (-2): 0	2 [PK3X4X] Euros in 12 months

Name of variable: pk3_5

Description: Would you rather receive 100 Euro today or [PK3X5X] Euro in 12 months?

Missings and Encoding:

Don't know/not specified (-1): 297	1 100 Euros today
Not asked (-2): 0	2 [PK3X5X] Euros in 12 months

Name of variable: pk3pat

Description: Numerical patience score (calculated from answers to pk3_x)

Descriptives:

Min.:	1.00	Max.:	32.00
1. Qu.:	21.00	3. Qu.:	31.00
Mean:	23.70	Median:	28.00

Missings and Encoding:

Don't know/not specified (-1): 321
Not asked (-2): 0

Name of variable: pk3x2x

Description: Numerical value displayed for pk3_2

Descriptives:

Min.:	125.00	Max.:	185.00
1. Qu.:	125.00	3. Qu.:	125.00
Mean:	137.93	Median:	125.00

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 151

Name of variable: pk3x3x

Description: Numerical value displayed for pk3_3

Descriptives:

Min.:	112.00	Max.:	202.00
1. Qu.:	112.00	3. Qu.:	139.00
Mean:	132.24	Median:	112.00

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 173

Name of variable: pk3x4x

Description: Numerical value displayed for pk3_4

Descriptives:

Min.:	106.00	Max.:	210.00
1. Qu.:	106.00	3. Qu.:	132.00
Mean:	130.53	Median:	119.00

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 211

Name of variable: pk3x5x

Description: Numerical value displayed for pk3_5

Descriptives:

Min.:	103.00	Max.:	215.00
1. Qu.:	103.00	3. Qu.:	136.00
Mean:	130.56	Median:	116.00

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 259

---

5 Socio-economic data

Name of variable: altq

Description: Age in years

Descriptives:

Min.:	18.00	Max.:	93.00
1. Qu.:	45.00	3. Qu.:	69.00
Mean:	56.23	Median:	57.00

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 0

Name of variable: so1

Description: Highest school-leaving qualification

Missings and Encoding:

Don't know/not specified (-1): 29
Not asked (-2): 0

1 No qualification
2 Qualification after a maximum of 7 years of school
3 Secondary school diploma
4 Secondary school leaving certificate (Mittlere Reife)
5 Technical college entrance qualification
6 Abitur

Name of variable: so2

Description: Highest vocational training or (technical) college degree

Missings and Encoding:

Don't know/not specified (-1): 140
Not asked (-2): 0

1 No qualification
2 Apprenticeship or vocational internship
3 Vocational preparation year
4 Apprenticeship, vocational training in the dual system
5 Preparatory service for the intermediate civil service
6 Vocational qualification at a
7 2- or 3-year school of health
8 Vocational school qualification (master craftsman/, technician)
9 Vocational academy, technical academy
10 Degree from a university of applied sciences
11 Degree from a university of applied sciences, including engineering
12 Degree from a university of applied sciences
13 Doctorate

Name of variable: so3_1

Description: I am employed or working (incl. trainees, persons on parental leave or partial r

Missings and Encoding:

Don't know/not specified (-1): 0
Not asked (-2): 0

0 No
1 Yes

Name of variable: so3_2

Description: I am a pupil

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_3

Description: I am a student

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_4

Description: I am retired

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_5

Description: I live from income from capital assets, renting or leasing

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_6

Description: I receive maintenance/benefits from spouse, partner, parents, relatives or other

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_7

Description: I am a housewife/husband or care for children and/or persons in need of care

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_8

Description: I receive Unemployment Benefit I (ALG I)

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_9

Description: I receive Unemployment Benefit II or social benefit (Hartz IV)

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_10

Description: I receive social assistance or basic old-age pension or basic income support in

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so3_11

Description: None of the above choices apply to me

Missings and Encoding:

Don't know/not specified (-1): 0	0 No
Not asked (-2): 0	1 Yes

Name of variable: so4

Description: Scope of employment

Missings and Encoding:

Don't know/not specified (-1): 12
Not asked (-2): 3347

1 Full-time employment
2 Part-time employment, at least 20 h
3 Part-time/hourly employment, less than 20h

Name of variable: so5

Description: Amount of total monthly net income of the household

Missings and Encoding:

Don't know/not specified (-1): 631
Not asked (-2): 0

1 Under 700 Euro
2 700 to under 1,200 Euro
3 1,200 to under 1,700 Euro
4 1,700 to under 2,200 Euro
5 2,200 to under 2,700 Euro
6 2,700 to under 3,200 Euro
7 3,200 to under 3,700 Euro
8 3,700 to under 4,200 Euro
9 4,200 to under 4,700 Euro
10 4,700 to under 5,200 Euro
11 5,200 to under 5,700 Euro
12 5,700 Euro and more

Name of variable: so6

Description: Receipt of a large amount of money/assets in the last 10 years

Missings and Encoding:

Don't know/not specified (-1): 91
Not asked (-2): 0

0 No
1 Yes

Name of variable: so6a

Description: Amount of money/asset

Missings and Encoding:

Don't know/not specified (-1): 97
Not asked (-2): 6147

1 Less than 5,000 euros
2 5,000 euros to less than 15,000 euros
3 15,000 euros to less than 25,000 euros
4 25,000 euros to less than 55,000 euros
5 55,000 euros to less than 150,000 euros
6 150,000 euros or more

Name of variable: so6b

Description: Expectation of monetary amount/asset value

Missings and Encoding:

Don't know/not specified (-1): 131
Not asked (-2): 6147

1 ...higher than expected
2 ...as high as expected
3 ...lower than expected

Name of variable: so7

Description: Political orientation

Missings and Encoding:

Don't know/not specified (-1): 255
Not asked (-2): 0

1 Left
2 2
3 3
4 4
5 5
6 6
7 7
8 8
9 9
10 Right

Name of variable: so8

Description: Inclination to a political party

Missings and Encoding:

Don't know/not specified (-1): 266
Not asked (-2): 0

1 CDU/CSU
2 SPD
3 FDP
4 Bündnis 90/ Die Grünen
5 Die Linke
6 AfD
7 Of another party
8 Of no party

6 Meta variables

Name of variable: start_datetime

Description: Start of interview date and time

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 0

Name of variable: end_datetime

Description: End of interview date and time

Missings and Encoding:
Don't know/not specified (-1): 0
Not asked (-2): 0

The German Heating and Housing Panel (GHHP) - Wave 1 Questionnaire

BMBF Kopernikus-Project ARIADNE

Marielena Krieg (RWI), Kathrin Kaestner (RWI)

September 28, 2023

Draft questionnaire Ariadne: Household energy use and energy efficiency

Current schedule:	Questionnaire reconciliation/revision:	week 14 to week 18
	Questionnaire programming:	week 19 to week 22
	Test:	week 23 to week 24
	Pretest:	week 25 to week 26
	Field time:	week 27 to week 32
	Delivery of results:	end of week 34

Previous studies referenced:

Energieverbrauch privater Haushalte	= n243102
EvalMap	
BDEW-Heizstudie	
Akzeptanz	= n4447
ENavi I	
ENavi III	= n73293
IWU-Fragebogen	

Programming notes appear in red font

Final sample:
N = 15,416 households from the forsa.omninet panel
10,008 owners
5,408 tenants

Target person in household:
The person in the household who decides - alone or together with the partner - when it comes to financial matters is surveyed.

Beyond the survey data, the following data should be included:

- Gender
- age
- Municipal code (GKZ)
- Postal code (PLZ)

Introductory text:

Climate policy is the subject of intense debate in Germany. Many of the instruments enshrined in the new climate protection program are specifically aimed at the building sector. Against this background, we at RWI - Leibniz Institute for Economic Research [Infobutton: RWI - Leibniz Institute for Economic Research is a leading center for scientific research and evidence-based policy advice in Germany and a member of the Leibniz Association. RWI's research - based on the latest theoretical concepts and modern empirical methods - ranges from the individual to the level of the global economy.]and Potsdam Institute for Climate Impact Research (PIK) [Infobutton: Expanding the scientific frontiers of climate research for global sustainability across disciplines and providing solutions for a safe and equitable climate future - this is the dual mission of the Potsdam Institute for Climate Impact Research (PIK), a member of the Leibniz Association]. to conduct a long-term study as part of a project funded by the German Federal Ministry of Education and Research (BMBF), consisting of an annual survey in 2021, 2022 and 2023.

In order to be able to answer our research questions, it is important that we conduct this survey over several years with as many of the same participants as possible. For this reason, if you decide to participate today, we ask that you also participate in subsequent surveys over the next two years.

In order to reduce your processing effort, we have decided to split the first survey into two parts:

1. first, as part of a preliminary survey, we ask you to answer questions about your household and your residential building.
2. the second step - the main survey - focuses more on renovations and your opinion on climate policy.

By participating in the survey, you support our research and help to gain insights into the effectiveness, cost burden and preference of certain climate policy measures among the population. By participating regularly, you can thus help influence political decisions on climate policy. We will be happy to inform you about the results of the study.

Of course, the study is subject to data protection. All data collected will be anonymized and only evaluated together with the data of other respondents. It is not possible to draw conclusions about you or your household without your explicit consent.

We would be pleased about your participation in the study and would like to thank you in advance for your cooperation.

Your forsa.omninet Team, RWI and PIK

1 Guidepost

Contents

The survey design has a two-stage structure.

1. Module 1: household and building characteristics is sent to the field
   (a) After one week of fieldwork, forsa sends the updated data from module 1 to the respondents
   (b) RWI takes over the calculation of energy demand and other key figures
   (c) RWI takes over the division into the two experimental groups (A: tenants and owners I and B: owners II).
   (d) RWI sends back a data set with ID, energy demand etc. and experimental group
2. the remaining part of the questionnaire (Incl. psychological control variables / environmental attitudes etc.) is sent to the field. All participants of the pre-survey are also invited to participate in the main survey (except dropouts), even if they answer "don't know"/"don't specify" to certain questions of the pre-survey. In the main survey, they are then filtered out for certain questions or are shown a general text/average score.

Experimental Group I (EG I): Tenants (A2=1); and all owners (A2 = 2) not included in Owner II. Filter:

- All for whom EG=2 does not apply: EG = 1 if EG I, i.e., tenants (A2 = 1) or owners (A2 = 2) for whom the following conditions apply:
- No central heating (Ist_12>= 4) OR
  - central heating, but no control over central heating (Ist_12a != 1)
  - Central heating, but living in houses built from 2002 onwards (Ist_6= 9 - 16, i.e. from 2002 onwards) and/or
  - central heating, but have already done a hydraulic balancing (San_3_6a = 4, so have done a hydraulic balancing) and/or
  - central heating, but whose heating pipes were insulated from 2002 onwards (Ist 13_a_1a = 3)

Experimental Group II (EG II): Owner II (control over heating decisions; i.e., restriction to households that meet the following criteria:
EG = 2, if EG II, i.e. owners (A2 = 2) for which the following conditions apply:

- Central heating (Ist_12 = 1-3, i.e. central heating).
- control over central heating (Ist_12a = 1, i.e. own residents have control or Ist3=1).
- AND do NOT meet at least one of the following criteria
  - live in houses built from 2002 onwards (Ist_6= 9 - 16, i.e. from 2002 onwards)
  - have already carried out a hydraulic balancing (San_3_6a = 4, i.e. have carried out a hydraulic balancing)
  - whose heating pipes were insulated from 2002 onwards (Ist 13_a_1a = 3)

2 Module 1: Household and building characteristics

First, we would like to ask you a few general questions about your household and the building in which you currently reside. If you have multiple residences, please think of your primary residence for the following questions.

A1: How many people, that is adults and children (including yourself), currently live in your household?

1. NUMBER FIELD 1-19
2. don't know/not specified

A2: Do you currently live in rented or owned housing, or is your housing provided to you free of charge?

1. rent
2. owned
3. left free of charge
4. don't know/not specified

If A2 = 1, i.e. rent:
A2_1a: Which of the following applies to your landlord/landlady?

1. private landlord
2. private housing company
3. public housing company
4. housing cooperative
5. don't know/not specified

A4: In what type of building is the apartment located?

1. detached one/two family house
2. terraced/double house
3. in an apartment building (up to seven stories)
4. in a high-rise building (eight or more floors)
5. in a (former and/or converted) industrial building
6. in a dacha, a vacation or garden home, a mobile home or similar
7. in another building
8. don't know/not specified

A5: How long have you lived in your house or apartment?

1. YYYY
2. don't know/not specified

A6: How long do you intend to stay in your house or apartment?

1. less than 1 year
2. 1-2 years

3. 3-5 years
4. 6-10 years
5. more than 10 years
6. don't know/not specified

A7: Do you rent apartments and/or houses (not including vacation rentals/houses)?

1. yes
2. no
3. don't know/not specified

If A7 = 1, i.e. yes:
A7a: How many apartments and/or houses do you rent out?
[Multiple choice]

1. _ NUMFELD Apartments 0-50
2. _ NUMFELD Houses 0-50
3. don't know/not specified

A8: Do you own a second or vacation apartment/house?

1. no
2. yes, second home/house
3. yes, vacation home/house
4. yes, both
5. don't know/not specified

If A8 = 2-4, i.e. yes:
A8a: How many months do you normally spend (i.e., not during the Corona pandemic) per year in your primary residence?

1. MM 1-12
2. don't know/not specified

Module 1: *Is*-state according to renovation configurator

In the following, you will find further information about the building you are currently living in, as well as about heating and hot water production.

Building characteristics
Ist1: Is your residential building free-standing or are neighboring buildings directly adjacent to your residential building?

Detached

on one side directly adjacent

on two sides directly adjacent

Ist2: What is the floor plan of your residential building?

Compact

elongated, angled or more complicated

1. compact
2. elongated, angled or more complicated
3. Do not know/not specified

Ist3: Please tell us the number of housing units (self-contained apartments) in your residential building. If you do not know, please estimate.

1. NUMBER FIELD 1-50
2. do not know/not specified

Ist4: Please tell us the number of floors in your residential building (excluding basement and attic).

1. NUMBER FIELD 1-50
2. do not know/not sepcified

Ist5: What is the size of the heated living space used by your household for living (excluding unheated basements, attics, business and utility rooms)? Please round and enter the value without decimal places.

1. NUMBER FIELD m2 1-999

2. don't know/not specified

If Ist3 > 1, i.e. more than one dwelling unit and A4 != 3 or A4 != 4, i.e. no multi-family or high-rise building:
Ist5a: What is the total heated living area in the house where you live? (not including unheated basement rooms, attics, business and utility rooms)? Please take into account your apartment as well as all other apartments in your house. If you do not know the exact value, please estimate.

1. NUMFELD m2 1-9999
2. don't know/not specified

Ist6: Please tell us the year of construction of your residential building. If you do not know exactly, please estimate.

1. until 1918
2. 1919 until 1948
3. 1949 until 1957
4. 1958 until 1968
5. 1969 until 1978
6. 1979 until 1983
7. 1984 until 1994
8. 1995 until 2001
9. 2002 until 2004
10. 2005 until 2006
11. 2007 until 2008
12. 2009 until 2013
13. 2014 until 2015
14. 2016 until 2019
15. from 2020
16. don't know/not specified

Ist7: What is the shape of the roof of your residential building?
[**Infobutton:** Flat pitched roofs are roofs with a pitch of less than 20 degrees. Pitched roof means all roof shapes such as gable roof, tent roof, hip roof, etc.]

1. pitched roof
2. flat roof or flat pitched roof
3. don't know/not specified

If Ist7 = 1, i.e. pitched roof:
Ist7_1a: Is the attic of your residential building heated?

1. attic fully heated
2. attic partially heated
3. attic unheated

4. don't know/not specified

If Ist7 = 1, i.e. pitched roof:
Ist7_1b: Are there any dormers or other roof structures on the roof of your residential building?

1. dormers or other roof structures present
2. dormers or other roof structures not present
3. don't know/not specified

Ist8: Is the basement of your residential building heated?

1. fully heated cellar
2. partially heated cellar
3. unheated cellar
4. not heated basement
5. don't know/not specified

Ist9: Now it is about the construction type of your residential building. Please select the predominant construction type of each component.
Show response option "Top floor" only if Ist_7 = 1, i.e. pitched roof.
[Single choice per component]

	Solid (e.g. masonry walls, concrete walls and ceilings)	Solid (e.g. masonry walls, concrete walls and ceilings)	Don't know/not specified
Roof	☐	☐	☐
Top floor ceiling [Infobutton: The top floor ceiling refers to the ceiling located above the last heated floor. If the attic is heated, this is the ceiling to the attic. If the attic is unheated, it is the ceiling below the attic].	☐	☐	☐
Exterior Walls	☐	☐	☐
Basement ceiling / floor to the ground (if no basement)	☐	☐	☐

Ist10: Please tell us the year your current windows were installed. If they have never been replaced, please list the year your building was built. If windows were installed at different times, please list the year the majority of your current windows were installed.

1. until 1918
2. 1919 to 1948
3. 1949 to 1957
4. 1958 to 1968

5. 1969 to 1978
6. 1979 to 1983
7. 1984 to 1994
8. 1995 to 2001
9. 2002 to 2004
10. 2005 to 2006
11. 2007 to 2008
12. 2009 to 2013
13. 2014 to 2015
14. 2016 to 2019
15. from 2020
16. don't know/not specified

Allow answer option 1 only if: Ist10 <= 5, i.e. installation before 1979
Answer option 3 only allow if: Ist10 >= 4, i.e. installation age class from 1958 onwards
Answer option 4 only allow if: Ist10 >= 3, i.e. installation age class as of 1949
Allow answer option 5 only if: If Ist10 >= 8, i.e. installation age class as of 1995
Show all if: Ist10 = 16, i.e don't know:

Ist11: How are the windows in your residential building (primarily) glazed?

1. windows, single glazed
2. wooden windows with double glazing
3. plastic windows with double glazing
4. aluminum windows with 2-fold glazing
5. windows with triple glazing
6. don't know/not specified

Heating and hot water

Now it is the question of how your residential building is heated and how you receive hot running water.

Ist12: What kind of heating system do you mainly use for heating?

1. boiler/heater (central)
2. heat pump (central)
3. district/local heating (central)
4. heating by dwelling (supply of individual dwelling units by own energy producer, e.g. by gas floor heating)
5. room-by-room heating (supply of individual rooms, e.g. with night storage heaters)
6. don't know/not specified

If Ist12 = 1-3, i.e. central heating and Ist3 > 1 and A2 = 2, i.e. ownership:
Ist12a: You indicated that there are several apartments in your house. Who in your house mainly makes renovation decisions regarding your central heating system?

1. residents of your own apartment (e.g. yourself)
2. residents of the other apartments
3. residents of your own apartment together with residents of other apartments
4. real estate company
5. public authority
6. housing cooperative
7. don't know/not specified

If ist12 = 1, i.e. boiler/heater (central):
Ist12_1a: Which fuel do you use for heating?

1. natural gas
2. liquid gas
3. fuel oil
4. logs/pellets
5. other
6. don't know/not specified

If Ist_12 = 2, i.e. heat pump:
Ist12_2a: How does your heat pump produce heat?

1. alone, i.e. heat pump only
2. heat pump with heating rod
3. heat pump with boiler
4. only heating rod
5. don't know/not specified

If Ist12 = 2, i.e. heat pump:
Ist12_2b: From where does your heat pump get the heat?

1. outside air
2. ground/groundwater
3. don't know/not specified

If Ist12 = 3, i.e. district/local heat:
Ist12_3a: From where do you get your district/local heating?

1. boiler/heating plant (pure heat generation)
2. combined heat and power plant (CHP) primarily for electricity generation (e.g. cogeneration plant, heat share less than 50
3. combined heat and power plant/cogeneration (CHP) primarily for heat generation (heat share over 50
4. other

5. don't know/not specified

If Ist12 = 5, i.e. room-by-room heating:
Ist12_5a: How do you heat your rooms (mainly)?

1. single stoves with fuel oil
2. single stoves with coal
3. single stoves with wood
4. gas space heaters
5. electric heaters or night storage heaters
6. don't know/not specified

For all heating types:
Ist13: In what year was your current heating system put into service?

1. until 1978
2. 1979 to 1982
3. 1983 to 1986
4. 1987 to 1989
5. 1990 to 1994
6. 1995 to 1999
7. 2000 to 2001
8. 2002 to 2004
9. 2005 to 2006
10. 2007 to 2008
11. 2009 to 2013
12. 2014 to 2015
13. 2016 to 2019
14. from 2020
15. don't know/not specified

If Ist12 = 1-3, i.e. for all central heating systems If Ist6 <= 8 or Ist6 = "don't know", i.e. year of construction before 2002:
Ist13a: Are the distribution pipes of your heating system insulated?

1. yes
2. no
3. don't know/not specified

If Ist13a = 1, i.e. Yes:
Ist13a_1a: Please tell us the year in which the distribution lines of your heating system were insulated.

1. before 1977
2. between 1977 and 2001

3. 2002 or later
4. don't know/not specified

Allow answer 1 only if: Ist12 = 1-3, i.e. central heating system
Allow answer 2 only if: Ist12 = 1, i.e. boiler/heater (central) OR Ist12 = 4, i.e. residential heating, OR Ist12_5a =1,2,3,4, i.e. fuel oil, coal, wood or gas space heaters
Allow answer 3 only if: Ist12 = 1,2,3, i.e. for all central heating OR Ist12 = 5, i.e. room-by-room heating
Answer 4 only allow if: Ist12 = 1,2,3, i.e. for all central heating systems OR Ist12 = 5, i.e. room-by-room heating system
Allow answer 5 only if: Ist12 = 4, i.e. heating by location
Answer 6 only allow if: Ist12 = 1, i.e. boiler/heater (central) OR Ist12 = 4, i.e. residential heating OR Ist12_5a =1,2,3,4, i.e. fuel oil, coal, wood, gas space heaters or electric heaters or night storage heaters
Answer 7 allow for ALL Ist12, i.e. all heating systems
Answer 8 allow for ALL Ist12, i.e. all heating systems:

Ist14: How do you get your hot water?

1. combined with central heating
2. central gas storage water heater
3. central electric storage heater
4. basement air/exhaust air heat pump
5. gas floor heating
6. gas instantaneous water heater
7. electric instantaneous water heater
8. electric storage tank/small storage tank
9. don't know/not specified

If Ist14 = 5-8, i.e. gas floor heating, gas instantaneous water heater, electric instantaneous water heater or electric storage tank/small storage tank:
Ist14a: In which year was your appliance from Ist14 put into operation:

1. up to 1978
2. 1979 to 1982
3. 1983 to 1986
4. 1987 to 1989
5. 1990 to 1994
6. 1995 to 1999
7. 2000 to 2001
8. 2002 until 2004
9. 2005 to 2006
10. 2007 to 2008
11. 2009 until 2013
12. 2014 until 2015

13. 2016 until 2019
14. from 2020
15. don't know/not specified

If Ist14=1-4, i.e. central water heating:
Ist14b: Please indicate which applies to your central water heating system:
(Show: Note: Without hot water circulation, the standing hot water in the pipe cools so that when the hot water faucet is turned on, cooled water flows first for a longer period of time; with hot water circulation, hot water comes out of each hot water faucet immediately. In most older buildings there is no hot water circulation)

1. without hot water circulation
2. with hot water circulation
3. don't know/not specified

If Ist6 <= 8 and Ist14=1-4, i.e. built before 2002:
Ist14c: Are your water pipes insulated?

1. yes
2. no
3. don't know/not specified

If Ist14c = Yes, i.e. insulated water pipes
Ist14c_1a: Please tell us the year your water pipes were insulated.

1. before 1977
2. between 1977 and 2001
3. 2002 or later
4. don't know/not specified

Show answer option "Top floor" only if: Ist7=1, i.e. pitched roof:
Ist15: This question asks to what extent the following components of your house are insulated. Please indicate the percentage of the insulated area:

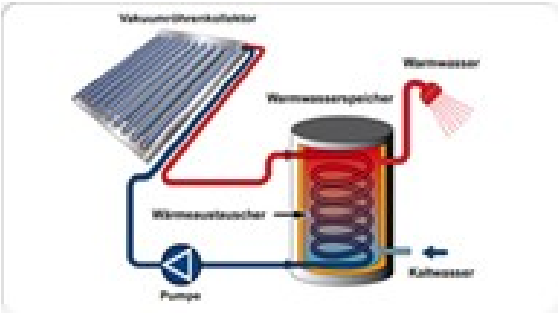
Scale:

- Not at all (=1)
- Somewhat (about $\frac{1}{4}$ of the area) (=2)
- About half (=3)
- Mostly (about $\frac{3}{4}$ of the area) (=4)
- Completely (=5)
- Don't know/not specified (=-1)

Items

1. Insulation of the roof
2. Insulation of the top floor ceiling [1]

[1] [Infobutton: The top floor ceiling refers to the ceiling located above the last heated floor. If the attic is heated, this is the ceiling to the attic. If the attic is unheated, it is the ceiling below the attic]



(d) Solar thermal system

(e) Photovoltaic system

3. Insulation of exterior walls (incl. basement wall)
4. Insulation of the basement ceiling/floor to the ground (if there is no basement)

Now we will briefly discuss the topic of renewable energies.
Ist16: Do you have a photovoltaic and/or solar thermal system for your house?
[multiple choice]

1. solar thermal system
2. photovoltaic system
3. neither
4. don't know/not specified

If Ist16=1, i.e. solar thermal system:
Ist16_1a: What is the heat from your solar thermal system used for?
[multiple choice]

1. as heating
2. for water heating
3. don't know/not specified

If A2=2, i.e. property:
17: Which of the following connection options does your home have?
[Multiple choice (but exclude that 1 and 2, 1 and 3, 2 and 3, 4 and 5, 4 and 6, and 5 and 6 are selected at the same time)]

1. gas connection
2. no gas connection, but street has gas pipeline
3. street has no gas pipeline
4. district heating connection
5. no district heating connection, but street has district heating pipeline
6. street has no district heating
7. don't know/not specified

2.1 Heating costs

If A2=1, i.e. tenant:
Ist18: Now we are talking about your heating and hot water costs. What is the amount of your monthly heating and hot water budget billing that you pay each month? This amount is stated, for example, in your lease, your utility bill, or your heating bill. If you do not know it exactly, please estimate. Please enter a full euro amount.

1. NUMFELD Euro 0-999
2. don't know/not specified

If Ist18 = 1, i.e. indicate monthly heating and hot water costs:
Ist18_1a: Have you used your rental contract, utility bill or heating bill for help?

1. yes
2. no
3. don't know/not specified

If Ist18_1a = 2, i.e. No:
Ist18_1b: How confident are you in your estimate regarding your budget billing payment?

(1) Very uncertain	(2) Uncertain	(3) Neither certain nor uncertain	(4) Certain	(5) Very certain
☐	☐	☐	☐	☐

If A2=2, i.e. property
Ist19: Now we are talking about your heating and hot water costs. What are your annual costs for heating and hot water? For example, this amount is mentioned on your bill. If you do not know exactly, please estimate. Please enter a full euro amount.

1. NUMFIELD Euro 0-9999
2. don't know/no indication

If Ist19 = 1, i.e. indicate annual heating and hot water costs.
Ist19_1a: Did you use your bill for help?

1. yes
2. no
3. don't know/not specified

If Ist19_1a = 2, i.e. No
Ist19_1b: How confident are you in your estimate about your heating and hot water costs?

(1) Very uncertain	(2) Uncertain	(3) Neither certain nor uncertain	(4) Certain	(5) Very certain
☐	☐	☐	☐	☐

2.2 Renovations

Show answer option "Upper floor ceiling" only if Actual7=1, i.e. pitched roof.
San1: The following is about the energy modernization of your residential building or apartment. Please indicate all modernization measures that have been carried out on your residential building since 2000.
[Multiple choice.]

1. insulation of the roof
2. insulation of the top floor ceiling [Infobutton: The top floor ceiling is the ceiling above the last heated floor. If the attic is heated, this is the ceiling to the attic. If the attic is unheated, it is the ceiling below the attic].
3. insulation of the outer wall (incl. basement wall)
4. insulation of the cellar ceiling/floor to the ground (if there is no cellar)
5. renovation of the windows
6. optimization of the existing heating system (e.g. implementation of hydraulic balancing, installation of high-efficiency pump, also insulation of the heating/hot water pipes)
7. installation of new devices for heat generation (e.g. heating boiler, solar thermal system, heat pump, instantaneous water heater, electric storage tank) or first-time district heating connection
8. no modernization measures carried out
9. other
10. don't know/not specified

If min. one measure carried out in san1. Show measures specified in san1 in matrix and then for each specified modernization measure in san1 = 1-7. Show answer option "upper storey ceiling" only if actual7=1, i.e. pitched roof.
San1a: For all modernization measures carried out, please indicate the start of implementation and the approximate investment costs, as well as whether and, if so, which subsidy you have claimed for the modernization measure.

Item	Start of implementation	Cost of the measure (without funding)	Use of a subsidy [Multiple Choice]
• Newly applied insulation of the roof • Newly applied insulation of the top floor ceiling • Newly applied insulation of the outer walls • Newly applied insulation of basement ceiling/floor • Renovation of windows • Optimization of existing heating system • Installation of new equipment for heat generation	• YYYY • Don't know/not specified [Do not allow year specification here and in following lines before 2000].	• up to 1.000 € • 1.000-3.000€ • 3.000-5.000€ • 5.000-10.000€ • 10.000-15.000€ • 15.000-20.000€ • 20.000-30.000€ • 30.000-40.000€ • 40.000-60.000€ • More than 60,000€ • Don't know/not specified	• Funding by the Federal Office of Economics and Export Control (BAFA) • Funding by the KfW • Other funding • No funding • Don't know/ not specified

If San1a: "Use of a subsidy" = "Subsidy by KfW" for at least 1 measure:
San1a_1a: You have indicated that you have taken advantage of a KfW subsidy. Were the modernization measures you indicated carried out as a complete refurbishment in the course of a KfW Efficiency House refurbishment?

1. yes, as KfW Efficiency House 55
2. yes, as a KfW Efficiency House 70
3. yes, as a KfW Efficiency House 85
4. yes, as KfW Efficiency House 100
5. yes, as KfW Efficiency House 115
6. no, as individual measure
7. don't know/not specified

If San1=5, i.e. renovation of windows:
San1_5a: What year did the windows in your residential building date from before the refurbishment?

1. until 1918
2. 1919 to 1948

3. 1949 to 1957
4. 1958 to 1968
5. 1969 to 1978
6. 1979 to 1983
7. 1984 until 1994
8. 1995 until 2001
9. 2002 until 2004
10. 2005 until 2006 1
11. 2007 until 2008 1
12. 2009 until 2013 1
13. 2014 to 2015 1
14. 2016 until 2019 1
15. from 2020 1
16. don't know/not specified

If San1=5, i.e. refurbishment of windows:
San1_5b: What material were the window frames made of before the rehabilitation (primarily) and how were the windows glazed before the rehabilitation? Please indicate what was true of the windows in your residential building prior to renovation.

1. windows, single glazed
2. wooden windows with double glazing
3. plastic windows with double glazing
4. aluminum windows with 2-fold glazing
5. windows with triple glazing
6. don't know/not specified

If San1=6, i.e. renovation of the existing heating system:
San1_6a: What measures have you taken to optimize the existing heating system? [multiple choice]

1. insulation of the heating pipes according to the German Energy Saving Ordinance (EnEV)
2. insulation of hot water distribution pipes according to Energy Saving Ordinance EnEV
3. installation of a high-efficiency pump
4. execution of a hydraulic balancing
5. other: free text field
6. don't know/not specified

If San1=7, i.e. installation of new appliances for heat generation
San1_7a: Which heat generation devices were newly installed or replaced in the course of the refurbishment? Please indicate for all applicable equipment types whether they were newly installed or replaced.

Scale:

- Newly installed (=1)
- Replaced (=2)
- Not applicable (=3)
- Don't know/not specified (=-1)

Items:

1. Boiler/Heat (central)
2. Electric heat pump/exhaust air heat pump
3. Solar thermal system
4. Gas instantaneous water heater for heating water
5. Electric instantaneous water heater for heating water
6. Electric storage tank/small storage tank for water heating
7. First connection to district heating network or local heating network

For all devices which have been replaced according to San1_7a. Show only for the selected devices:
San1_7a_1a: Approximately what year did your heat generating equipment replaced by the retrofit date from?

Appliances:

1. boiler/heater (central)
2. electric heat pump/exhaust air heat pump
3. solar thermal system
4. gas instantaneous water heater for hot water production
5. electric instantaneous water heater for hot water preparation
6. electric storage tank/small storage tank for water heating.

Scale:

1. until 1978
2. 1979 to 1982
3. 1983 to 1986
4. 1987 to 1989
5. 1990 to 1994
6. 1995 to 1999
7. 2000 to 2001
8. 2002 until 2004
9. 2005 to 2006
10. 2007 to 2008
11. 2009 until 2013
12. 2014 until 2015

13. 2016 until 2019
14. from 2020
15. don't know/not specified

If San1_7a, i.e. boiler/therm (central) replaced
San1_7a_1b: What fuel was used to heat your boiler/therm before the renovation?

1. natural gas
2. liquid gas
3. fuel oil
4. logs/pellets
5. other
6. don't know/not specified

If San1=7, i.e. installation of new appliances for heat generation and San1_7a not 4, 5 or 6, i.e. not gas instantaneous water heaters, electric instantaneous water heaters or electric storage tanks/small storage tanks for hot water generation:
San1_7b: For what purpose were appliances for heat generation newly installed or replaced?

1. only for heating
2. only for hot water production
3. for heating and hot water production
4. don't know/not specified

For all measures indicated in San1 = 1-4:
San_1b: This question asks to what extent the following components of your house were already insulated before your renovation. Please indicate the percentage of insulated area in your statement:

Scale:

- Not at all (=1)
- Somewhat (about $\frac{1}{4}$ of the area) (=2)
- About half (=3)
- Mostly (about $\frac{3}{4}$ of the area) (=4)
- Completely (=5)
- Don't know/not specified (=-1)

Items

1. Insulation of the roof
2. Insulation of the top floor ceiling [2]
3. Insulation of exterior walls (incl. basement wall)
4. Insulation of the basement ceiling/floor to the ground (if there is no basement)

[2] [Infobutton: The top floor ceiling refers to the ceiling located above the last heated floor. If the attic is heated, this is the ceiling to the attic. If the attic is unheated, it is the ceiling below the attic]

San2: Since 2000, have you received energy advice for residential buildings that informed you about energy-efficient building renovation?

1. yes
2. no
3. don't know/not specified

If San2 = 1, i.e. Yes:
San_2a: When did you take advantage of energy advice?

1. NUMBER FIELD 2000 - 2021
2. don't know/not specified

Show answer option "Upper floor ceiling" only if: Is7=1, i.e. pitched roof:
San3: The following is about a possible planned modernization of your residential building or apartment. Please indicate any modernization measures you plan to carry out on your residential building by the year 2030.
[multiple choice]

1. insulation of the roof
2. insulation of the top floor ceiling (The top floor ceiling is the ceiling above the last heated floor. If the attic is heated, this is the ceiling to the attic. If the attic is unheated, it is the ceiling below the attic).
3. insulation of the outer wall (including the basement wall)
4. insulation of the cellar ceiling/floor to the ground (if there is no cellar)
5. renovation of the windows
6. optimization of the existing heating system (e.g. implementation of hydraulic balancing, installation of high-efficiency pump, also insulation of the heating/hot water pipes)
7. installation of new devices for heat generation (e.g. heating boiler, solar thermal system, heat pump, instantaneous water heater, electric storage tank) or first-time district heating connection
8. other: textbox
9. no modernization measures planned
10. don't know/not specified

Show question only if: San3!=9,10 , i.e. modernization measure carried out:
San3a: You have indicated that you are planning at least one measure. Do you plan to carry out this measure as part of a KfW Efficiency House refurbishment?

1. yes, as KfW Efficiency House 55
2. yes, as a KfW Efficiency House 70
3. yes, as a KfW Efficiency House 85
4. yes, as a KfW Efficiency House 100
5. yes, as KfW Efficiency House 115
6. no, as individual measure
7. don't know/not specified

Show items 4-8 only if: A2=2, i.e., owner:
San4: Please indicate the extent to which you agree with each of the following statements:
[Randomize]

Scale:

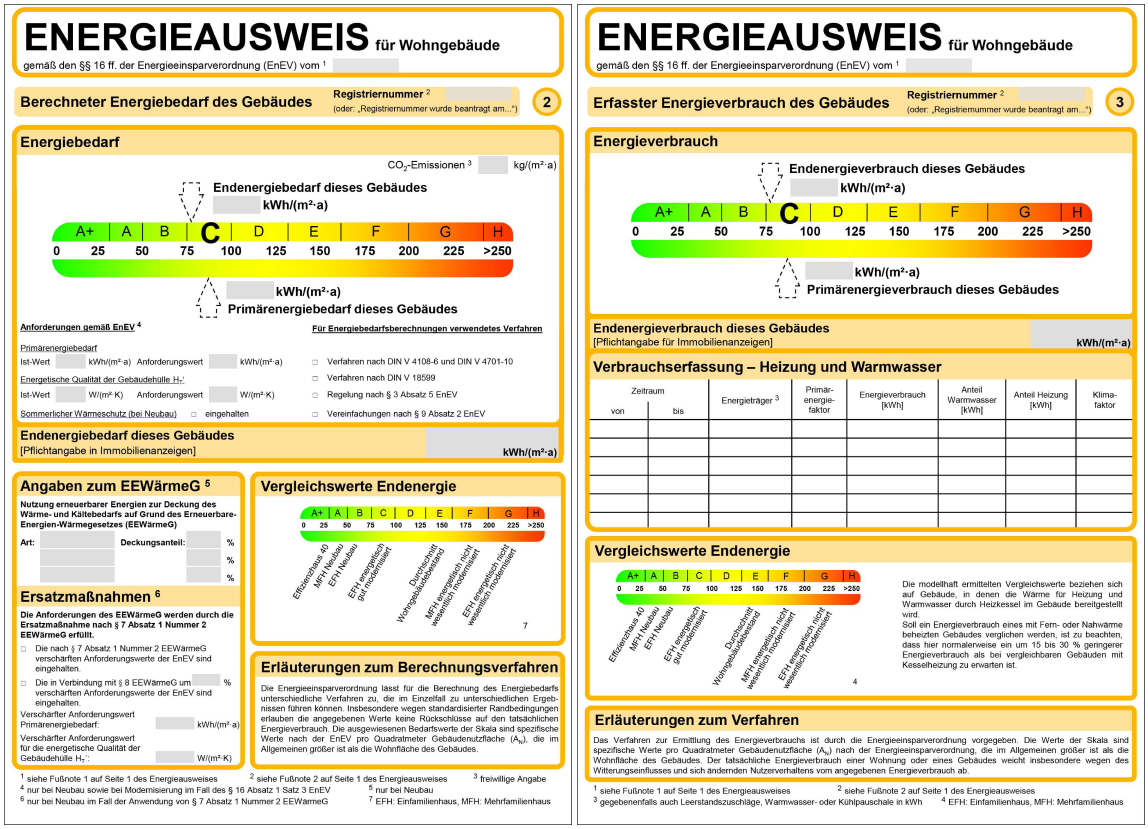
- Do not agree at all (=1)
- Do not agree (=2)
- Neither agree nor disagree (=3)
- Agree (=4)
- Completely agree (=5)
- Don't know/not specified (=-1)

Items:

1. Energy renovation measures can significantly reduce the heating energy consumption in my residential building.
2. Energy costs in Germany are high.
3. Heating energy costs for private households will rise in the future.
4. Energy consulting is necessary for me to make renovation decisions.
5. I can't afford energy renovation measures.
6. Even with the government subsidy programs, energy-efficient renovation measures do not pay off financially for me.

If A2 = 1, i.e. rent:
EA1: Did you receive an energy certificate when you rented your apartment?
[Show images]

1. yes
2. no
3. don't know/not specified

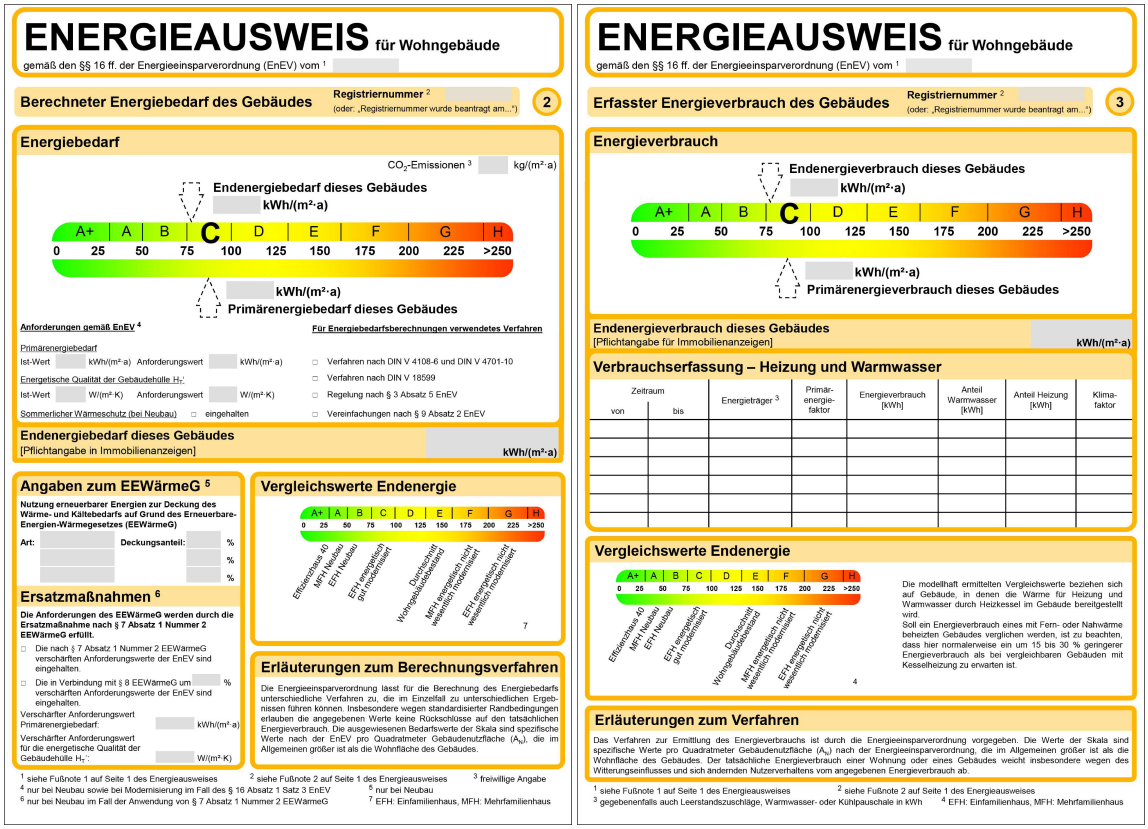


Demand certificate Consumption certificate

If A2 = 2, i.e. owner:

EA2: Do you have an energy certificate for the building you currently live in? [Show images]

1. yes
2. no
3. don't know/not specified



Demand certificate Consumption certificate

2.3 Beliefs about building efficiency

Bel1: The energy efficiency of a house is measured by the so-called final energy demand. The final energy demand indicates how much energy you need for hot water, heating and, if necessary, ventilation. It is expressed in kilowatt hours (kWh) per square meter of living space (m2) and year (annum, a).
This measure can be estimated from the characteristics of your building using a standardized procedure. Your usage behavior plays no role in this estimate.
The final energy demand of a building is represented as follows, for example:

Low values (green background) mean a high energy efficiency of your building. High values (highlighted in red) mean a low energy efficiency of your building. **Please estimate the current final energy demand of the building you live in (in kWh / (m² * a)):**

1. NUMFIELD (kWh/(m2 * a)) [CHECK that numerical values are entered (limits 0-9999)]
2. don't know/not specified

Effectiveness of renovation measures
Belief_2:
[Randomize with sliding options]

You can reduce the final energy demand of your building through renovation measures. Please estimate the amount of possible savings of the following measures for your building. Arrange the measures so that the measure with the highest savings is at the top and the measure with the lowest savings is at the bottom. Assume that your house is in its current state and that the measures are implemented one at a time.

1. complete insulation of the roof or the top floor ceiling [Infobutton: The top floor ceiling refers to the ceiling located above the last heated floor. If the attic is heated, this is the ceiling to the attic. If the attic is unheated, it is the ceiling below the attic] [Do not show if: Actual7=2, i.e. flat roof].
2. complete insulation of the outer wall (incl. basement wall)
3. complete insulation of the cellar ceiling/floor to the ground (if there is no cellar)
4. installation of windows with triple glazing
5. installation of a modern central heating system
6. optimization of the existing heating system (e.g. hydraulic balancing, installation of high-efficiency pump, also insulation of heating/hot water pipes)
7. don't know/not specified

3 Module 2: Experiment on acceptance of additional costs due to CO2 pricing (tenants + owners I)

Start of filter Experimental Group I (EG I)
Co0: In its last climate protection package, the German government introduced the following instruments, among others. We ask you to indicate how much you agree with the statements about each measure.
[Randomize]

a) A ban on the installation of oil-fired boilers as of 2026

b Tax incentives for energy-efficient renovation measures for owner-occupiers (e.g., heating system replacement and thermal insulation): The subsidy is provided through a deduction of the subsidy amount from the tax liability spread over 3 years.

c) Increase in subsidies for the replacement of fossil heating systems (natural gas and oil) with a subsidy share of 40 percent for a new, more efficient heating system.

d) Free energy consulting (e.g. by the consumer centers).

Scale:

- 1 Completely disagree (=1)
- 2 (=2)
- 3 (=3)
- 4 (=4)
- 5 Completely agree (=5)
- Don't know/not specified (=-1)

Items:

1. Overall, I think this measure is good.
2. This measure is well suited to reduce emissions in the building sector.
3. This measure will increase inequality in Germany.

Co0a: In addition, other instruments are currently being discussed. We ask you to indicate how much you agree with the statements on each measure
[Randomize]

a) A ban on the installation of gas boilers

b) Tax incentives for energy-efficient renovation measures for landlords (e.g., heating system replacement and thermal insulation), for example, via accelerated depreciation.

c) Mandatory use of renewable energies (e.g., heat pump or solar thermal) in new construction.

d) Mandatory compliance with high efficiency standards in new construction as so-called nearly zero-energy buildings.

e) A building climate levy: A levy based on the greenhouse gas emissions of the building that owners of buildings pay.

Scale:

- 1 Completely disagree (=1)
- 2 (=2)

- 3 (=3)
- 4 (=4)
- 5 Completely agree (=5)
- Don't know/not specified (=-1)

Items:

1. Overall, I think this measure is good.
2. This measure is well suited to reduce emissions in the building sector.
3. This measure will increase inequality in Germany.

On January 1, 2021, a CO2 levy was introduced in Germany, which also applies to heating energy.
Co1: Based on everything you know about the CO2 levy, how well informed do you feel about it?

1. not informed at all
2. rather not informed
3. neither
4. rather informed
5. very well informed
6. don't know/not specified

For information: Consumers pay a fixed levy per ton of CO2 produced by the consumption of heating oil and natural gas. In a well-insulated house, which has an efficient heating technology, there are accordingly fewer additional costs due to the CO2 levy than in an unrenovated house with an inefficient heating system.
In the following, we now ask you to answer some general questions about the effects of the CO2 tax on your personal behavior.

Co2: How much do you think the CO2 tax will affect your personal heating behavior?

1. no impact
2. small impact
3. moderate impact
4. large impact
5. very large impact
6. don't know/not specified

If A2=2, i.e. property
Co3: In your estimation, how much impact will the CO2 tax have on whether or to what extent renovation and modernization measures will be carried out on your residential property in the next few years?

1. no impact
2. small impact
3. moderate impact
4. major impact

5. very large impact
6. don't know/not specified

Again all
Co5: Now we would like you to answer some questions about your perception of the CO2 levy. Please use the scale from 1 to 5
[Randomize]

Scale:

- 1 Completely disagree (=1)
- 2 (=2)
- 3 (=3)
- 4 (=4)
- 5 Completely agree (=5)
- Don't know/not specified (=-1)

Items:

1. The CO2 price is a heavy financial burden for me.
2. Because of the additional costs due to the CO2 price, I will have to do without other things.
3. The CO2 price is an effective instrument for protecting the climate.
4. The CO2 price helps to achieve climate protection targets.
5. Revenue from carbon pricing will go to the right causes.
6. I trust the politicians that the additional revenues from the CO2 price will be used adequately.
7. The CO2 price increases inequality in Germany.
8. The carbon price places an excessive burden on low-income households.
9. It is up to me to decide how much additional costs I will incur as a result of CO2 pricing.
10. I cannot influence how much my heating and hot water costs increase due to the CO2 price.

Random division into 3 groups:

1.) Cost increase: 30 Euro per ton CO2

2.) Cost increase: 55 Euro per ton CO2

3.) Cost increase:130 Euro per ton CO2

Mod2 = 1, 2, 3, 4 or 5 will be provided by RWI
Mod2 = 1: If district heating, space heating and energy source neither natural gas nor fuel oil, heat pump or "don't know/no specification" (i.e. if Ist12=3, Ist12=5 and Ist12_5a != 1 or 4, Ist12=2, Ist12=6), furthermore if Ist12=1 (i.e. central), but fuel LPG, logs/pellets or other (i.e. Ist12 = 2,4,5 or 6)
The costs for heating and hot water in buildings heated with fuel oil or natural gas are on average about 11 Euro per m^2 per year. For a 70m^2 apartment, that's about 770 euros.

A CO2 price of 30/55/130 euros per ton is envisaged for the next few years.

This would result in an average increase of about 11/20/50% in the cost of heating and hot water in buildings that heat with fuel oil or natural gas. On average, for a 70m^2 apartment, this is

associated with a cost increase of approximately 90/160/390 euros per year.

Mod2 = 2: If natural gas and calculation of final energy demand possible (if Ist12_1a=1 EBJ available)Based on your information about the building characteristics, the cost of heating and hot water in your apartment/house is approx. energy demand*m^2*price of natural gas Euro.

For the next years a CO2 price of 30/55/130 Euro per ton is foreseen.

This would cause your costs for heating and hot water to increase by approx. 11/20/50% compared to today. This is accompanied by a cost increase of approximately 1.11/2/4.82*m^2 euros.

Mod2 = 3: If natural gas and calculation of final energy demand not possible (if Ist12_1a=1 EBJ not available)The cost of heating and hot water in buildings heated with natural gas is on average about 10 euros per m^2 per year. For a 70m^2 apartment, this is about 700 euros.

A CO2 price of 30/55/130 euros per ton is envisaged for the next few years.

This would lead to an average increase of about 11/20/50% in the cost of heating and hot water in buildings heated by natural gas compared to today. On average, for a 70m^2 apartment, this is associated with a cost increase of approximately 80/140/340 euros per year.
Mod2 = 4: If heating oil and calculation of final energy demand possible (if Ist12_1a=3 EBJ available).Based on your information about the building characteristics, the cost of heating and hot water in your apartment/house is approx. energy need*m^2*heating oil price Euro. (EBJMP)

For the next few years, a CO2 price of 30/55/130 euros per ton is envisaged.

This would cause your costs for heating and hot water to increase by approx. 11/20/50%compared to today. This is accompanied by a cost increase of approximately 1.46/2.64/6.31*m^2 euros per year.

Mod2 = 5: If heating oil and calculation of final energy demand not possible (if Ist12_1a=3 EBJ not available).The costs for heating and hot water in buildings that heat with fuel oil are on average about 12 Euro per m^2 per year. For a 70m^2 apartment, this is about 840 euros.
A CO2 price of 30/55/130 euros per ton is envisaged for the next few years. This would lead to an average increase of about 11/20/50% in the cost of heating and hot water in buildings that heat with fuel oil compared to today. On average, for a 70m^2 apartment, this translates into a cost increase of approximately 100/185/440.

Random division into 3 groups (independent of previous division):

A.) control group (no further information).

B.) Support programs

C.) Redistribution

If "control group":
A large part of the revenue from the CO2 tax is to be redistributed to the population. However, it is currently unclear exactly what the revenue from CO2 pricing will be used for.

In the case of the "incentive programs" group:
A large portion of the revenue from the CO2 tax is to be redistributed to the population. The funds will be used to provide greater financial subsidies to homeowners for energy-efficient building renovation (e.g., thermal insulation, heating system replacement).

If "redistribution" group: A large part of the revenue from the CO2 levy is to be redistributed to the population. The funds will be used to provide greater financial relief to all citizens, for example through a lower electricity price.

Again all
Co4: Please now state your general opinion on the CO2 levy. Please use the scale from 1 to 5.

Scale:

- 1 Completely disagree (=1)
- 2 (=2)
- 3 (=3)
- 4 (=4)
- 5 Completely agree (=5)
- Don't know/not specified (=-1)

Items:

1. I think the introduction of the CO2 price is good overall.
2. This measure is well suited to reduce emissions in the building sector.
3. This measure will increase inequality in Germany.

Currently, there are four different schemes being discussed on how the additional costs from carbon pricing should be shared between tenants and landlords.
[Randomize]

1. half of the additional costs are borne by tenants and half by landlords (halving)
2. the share of the additional costs borne by tenants and landlords depends on the energy quality of the building: the higher the energy efficiency of a building, the lower the share borne by landlords and the higher the share borne by tenants (split according to building stock).
3. landlords may pass on the additional costs to tenants in full, as they are part of the heating costs (100% tenants).
4. landlords bear the full amount of the additional costs themselves (100% landlords).

Co6: In general, how do you evaluate the regulations for sharing the additional costs between tenants and landlords that result from the CO2 levy?
[Randomize]

Scale:

- Strongly reject (=1)
- Reject (=2)
- Neither (=3)
- Agree (=4)
- Strongly agree (=5)
- Don't know/not specified (=-1)

Items:

1. Halving
2. According to building substance
3. 100% tenant
4. 100% landlord

Now we would like you to indicate how you evaluate the proposed allocation of additional costs.
Co7a: How fair do you think these arrangements are?
[Randomize]

Scale:

- Very unfair (=1)
- Rather unfair (=2)
- Neither (=3)
- Rather fair (=4)
- Very fair (=5)
- Don't know/not specified (=-1)

Items:

1. Halving
2. According to building substance
3. 100% tenant
4. 100% landlord

Co7b: What effect do you think these regulations would have on climate change mitigation?
[Randomize]

Scale:

- 1 Very small effect (=1)
- 2 (=2)

- 3 (=3)
- 4 (=4)
- 5 Very strong effect (=5)
- Don't know/not specified (=-1)

Items:

1. Halving
2. According to building substance
3. 100% tenant
4. 100% landlord

Co7c: What do you estimate would be the additional financial burden on tenants under the following provisions?
[Randomize]

Scale:

- 1 Very low (=1)
- 2 (=2)
- 3 (=3)
- 4 (=4)
- 5 Very high (=5)
- Don't know/not specified (=-1)

Items:

1. Halving
2. According to building substance
3. 100% tenant
4. 100% landlord

Co8: If you were completely free to choose, how do you think the costs of the CO2 levy should be divided between tenants and landlords (percentages given)?

												Don't know / not specified
Tenant	100	90	80	70	60	50	40	30	20	10	0	
Landlord	100	90	80	70	60	50	40	30	20	10	0	

Co10: In your opinion, how high is the incentive for landlords to invest in a new heating system if the additional burden caused by the CO2 levy is divided between tenants and landlords as follows?

Scale:

- 1 Very low (=1)
- 2 (=2)

- 3 (=3)
- 4 (=4)
- 5 Very high (=5)
- Don't know/not specified (=-1)

Items:

1. Tenant 100 — Landlord 0
2. Tenant 80 — Landlord 20
3. Tenant 50 — Landlord 50
4. Tenant 20 — Landlord 80
5. Tenant 0 — Landlord 100

Co11: In your opinion, how high is the incentive for landlords to invest in thermal insulation measures if the additional burden caused by the CO2 levy is divided between tenants and landlords as follows?

Scale:

- 1 Very low (=1)
- 2 (=2)
- 3 (=3)
- 4 (=4)
- 5 Very high (=5)
- Don't know/not specified (=-1)

Items:

1. Tenant 100 — Landlord 0
2. Tenant 80 — Landlord 20
3. Tenant 50 — Landlord 50
4. Tenant 20 — Landlord 80
5. Tenant 0 — Landlord 100

Co12: How satisfied are you currently with the following features of your apartment/house on a scale from 0 (not at all satisfied) to 10 (completely satisfied)?

Scale:

- 0 Not at all satisfied (=1)
- 1 (=2)
- 2 (=3)
- 3 (=4)
- 4 (=5)
- 5 (=6)

- 6 (=7)
- 7 (=8)
- 8 (=9)
- 9 (=10)
- 10 Completely satisfied (=11)

Items:

1. With the apartment/house (e.g. room layout, condition)
2. With the location and accessibility
3. With the cold rent [if tenant, i.e. A2=1]
4. With the cold additional costs (e.g. garbage disposal, winter service, insurances)
5. With the warm service charges (heating and hot water)
6. With your apartment/house as a whole

Filtering Experimental Group I (EG I)

4 Module 3: Experiment on remediation decisions (owner II)

[If NA = 0, i.e., values could be calculated]

ExpSan_1: Introduction Heating System Optimization

In this part of the survey, we are interested in your interest in optimizing your heating system.

In a heating optimization, an installer insulates heating pipes in your house, calculates the heating energy demand in your rooms, and adjusts the radiators optimally for it.

The optimization has no effect on the lifetime of your radiators or your heating system. It does not require major remodeling and can typically be completed in one business day.

ExpSan_2: Introduction Procedure

Below, you will be given the opportunity to choose between two methods of heating optimization: a "simple heating optimization" and a "comprehensive heating optimization".

In a simple heating optimization, a specialized company insulates the heating pipes in your house according to the current insulation standard. This heating optimization takes about 1-2 hours.

In the case of a comprehensive heating optimization, a specialist company insulates the heating pipes in your house according to the current insulation standard. In addition, it calculates the heating energy demand in your rooms and optimally adjusts the radiators accordingly. This heating optimization takes about 7-8 hours.

ExpSan_3: Introduction Procedure II

For your decision you will receive a budget of 1500 Euro. You can use this budget to order a simple or a comprehensive heating optimization. Your decision can have real consequences. One randomly drawn participant of this survey will actually receive this budget and can use it to commission a

heating optimization. For this participant, the selected heating optimization will actually be implemented by a specialist company. In addition, this participant will receive the part of the budget that exceeds the price of the selected heating optimization.

The draw will take place in the coming weeks. You will be notified if you are randomly selected. The selection of the specialist company will take place in consultation with you. Please consider your decision well on the following pages as it may have real implications for you.

Question ebewertung_1:
If you do not consider optimizing your heating system under any circumstances, please check the box below. You will then not be entered into the draw. Please just click on "continue" to participate in the draw. This will not affect the duration of the survey.

- I will not consider optimizing my heating system under any circumstances and I will forego the possibility of receiving a budget of 1500 EUR, which I can use for heating system optimization, among other things.
  [Boxes to check off]

ExpSan_4: Presentation of the savings potential
We will now inform you about the improvement of your energy demand, which can be achieved by a simple or a comprehensive heating optimization in your house. The calculations take into account the information you have given us about the characteristics of your house. They are based on a method which, among other things, is prescribed for the issuance of energy certificates.
[**Infobutton:** Since a simplified method is used, the values may differ slightly from those stated on energy certificates].

The calculated savings also take into account what kind of heating optimization you may have performed previously. Savings are expressed in kilowatt-hours of heating energy per heated living area per year (kWh/ m2*a).
[Option A and Option B are determined randomly. I.e. some participants get randomly the simple optimization as option A, while others get the comprehensive optimization as option A. Option B is then accordingly the comprehensive optimization in the first case and the simple optimization in the second case. The information about which option is displayed as option A should be saved].

	Option A: Simple heating optimization	Option B: Comprehensive optimization
Current final energy demand	Final energy demand now kWh/m2*a	Final energy demand now kWh/m2*a
Final energy demand after optimization	Final energy demand after simple optimization kWh/m2*a	Final energy demand nowkWh/m2*a
Improvement of the final energy demand	Final energy demand now - Final energy demand after simple optimization kWh/m2*a	Final energy demand now - Final energy demand after comprehensive optimization kWh/m2*a

ExpSan_5: Explanation We present you with 15 choices between these two heating optimizations at once, with only the price of the comprehensive heating optimization differing. Please choose in each of the 15 lines which heating optimization you prefer for the given prices.

The choices are about the influence of the prices you have to pay on your choice between the two heating optimizations. The fact that the price of a comprehensive heating optimization differs may be due, for example, to the fact that it is subsidized or taxed at different rates. However, you can

be sure that the quality of the heating optimization does not differ and it is always performed by a professional company. In case you are drawn, you will receive the heating optimization you have chosen in one line for the specified price. Which line this is will be determined randomly. In addition, you will receive your remaining budget (1500 euros minus the respective price of the heating optimization) by bank transfer.

Since each line can be selected, you should carefully consider your decision in each line.

ExpSan_5: Explanation II
For a better understanding we now show you an example.

A section of the table where you will enter your decisions will look like the one shown below.

You will make your decisions only on the next page. In this table you cannot mark any options. [Display options as Option A or B as described above].
Option A: Simple heating optimization (Savings: final energy demand now - final energy demand after simple optimization kWh/m2*a)

Option B: Comprehensive heating optimization (Savings: Final energy demand now - Final energy demand after comprehensive optimization kWh/m2*a)

7. choose A for 300 euro □ - choose B for 500 euro □
8. choose A for 300 euro □ - choose B for 550 euro □
9. choose A for 300 Euro □ - choose B for 600 Euro □

Each row of the table contains a decision to be made. For each decision, you choose either option A or option B.

Now please assume, for example, that you were drawn by lot and that row 8 was chosen at random.

- If you chose option B in line 8, you will receive the comprehensive heating optimization at a price of 550 euros. In addition, we will transfer your remaining budget of 1500-550 = 950 EUR.
- If you have chosen option A in line 8, you will receive the simple heating optimization at the price of 300 EUR. In addition, we will transfer your remaining budget of 1500-300 = 1200 EUR.

For group C2 or T2
ExpSan_6_C2_T2: Decisions Round I We now show you 15 decisions between a simple and the comprehensive heating optimization. The decisions differ only in the price you have to pay for the comprehensive heating optimization.
Now, for each of the 15 rows, please select the heating optimization that you prefer for the corresponding prices: [**Infobutton:** As a reminder, you will receive a budget of 1,500 euros for your decision. In case of a simple heating optimization, the optimization of your heating will be carried out at the price of 300 euros and your remaining budget of 1,200 euros will be transferred to you. In case of a comprehensive heating optimization, the optimization of your heating will be carried out at the price indicated in the respective line and your remaining budget will be transferred to you. A randomly drawn participant will actually receive this budget. However, your decision has no influence on the draw.]

[Presenting options as Option A or B as described above]

Option A: Simple heating optimization (Savings: final energy demand now - final energy demand after simple optimization kWh/m2*a)

Option B: Comprehensive heating optimization (Savings: final energy demand now - final energy demand after comprehensive optimization kWh/m2*a)

[Three columns: Decision — Option A (Simple heating optimization) — Option B (Comprehensive heating optimization)

Answer options: For each decision situation, there are two answer choices (boxes): one for "Choose A" and another for "Choose B"]

1. choose A for 300 euro □ - choose B for 300 euro □
2. choose A for 300 euro □ - choose B for 350 euro □
3. choose A for 300 Euro □ - choose B for 400 Euro □
4. choose A for 300 Euro □ - choose B for 450 Euro □
5. choose A for 300 Euro □ - choose B for 500 Euro □
6. choose A for 300 Euro □ - choose B for 550 Euro □
7. choose A for 300 Euro □ - choose B for 600 Euro □
8. choose A for 300 Euro □ - choose B for 650 Euro □
9. choose A for 300 Euro □ - choose B for 700 Euro □
10. choose A for 300 Euro □ - choose B for 750 Euro □
11. choose A for 300 euro □ - choose B for 800 euro □
12. choose A for 300 euro □ - choose B for 900 euro □
13. choose A for 300 euro □ - choose B for 1000 euro □
14. choose A for 300 euro □ - choose B for 1200 euro □
15. choose A for 300 euro □ - choose B for 1500 euro □

For group T1 and T2

ExpSan_7_T1_T2: Screen for treatment group.

We would now like to give you more information about the savings potential of a heating optimization in your home.

The savings calculations take into account the information you provide about the characteristics of your home and the fuel(s) you use.

	Option A: Simple heating optimization	Option B: Comprehensive optimization
Annual energy savings in your home	[Ist_5]*(Final energy demand now final energy demand after simple optimization) kWh	[Ist_5]*(Final energy demand now final energy demand after comprehensive optimization) kWh
Annual cost savings in your home	Costs now - costs after simple optimization EUR	Costs now - costs after comprehensive optimization EUR

Comprehensive heating optimization therefore leads to a higher annual cost saving for you by (costs now - costs after comprehensive renovation) - (costs now - costs after simple renovation) = cost difference in EUR compared to simple heating optimization.
Over the course of 10 years, the cost advantage of comprehensive heating optimization compared to simple heating optimization adds up to

- $KDF * 10$ **EUR** at constant energy prices
- $KDF * 1.02 * ((1 - 1.02^{10})/(1 - 1.02))$**EUR** with energy prices increasing by 2% per year
- $KDF * 0.98 * ((1 - 0.98^{10})/(1 - 0.98))$ **EUR** with energy prices decreasing by 2% per year

For group C1a and C2 (group C1b sees neither screen for control group nor for treatment group)
ExpSan_7_C1_C2: Screen for control group
We would now like to provide more information on the frequency of performing heating optimizations over time.
In Germany, the performance of heating optimizations has been at a constant level for years.

- In the 1st half of 2017, 69,720 optimizations took place.
- In the 2nd half of 2017, 79,789 optimizations took place.
- In the 1st half of 2018, 71,248 optimizations took place.
- In the 2nd half of 2018, 77,987 optimizations took place.
- In the 2st half of 2019, 67,744 optimizations took place.

Source: Wuppertal Institute / arepo (2017)

For group C2 and T2
ExpSan_8_C2_T2: Decisions Round II
You will now be given the opportunity to make your decisions again and adjust them if necessary. We show you again 15 decisions between a simple and the comprehensive heating optimization.

Please select now again for each of the 15 lines the heating optimization you prefer for the corresponding prices:
[Display options as Option A or B as described above.]
Option A: Simple heating optimization (Savings: final energy demand now - final energy demand after simple optimization in kWh/m2*a)

Option B: Comprehensive heating optimization (Savings: final energy demand now - final energy demand after simple optimization kWh/m2*a)

[**Infobutton:** Reminder: if you are drawn, your budget is 1500 EUR to spend on one of the options. The remaining part of the budget will be paid out to you.]
[Three columns: Decision — Option A (Simple heating optimization) — Option B (Comprehensive heating optimization).
Answer options: For each decision situation, there are two answer options (boxes): one for "Choose A" and another for "Choose B"]

1. choose A for 300 euro ☐ - choose B for 300 euro ☐
2. choose A for 300 euro ☐ - choose B for 350 euro ☐
3. choose A for 300 Euro ☐ - choose B for 400 Euro ☐
4. choose A for 300 Euro ☐ - choose B for 450 Euro ☐
5. choose A for 300 Euro ☐ - choose B for 500 Euro ☐

6. choose A for 300 Euro ☐ - choose B for 550 Euro ☐
7. choose A for 300 Euro ☐ - choose B for 600 Euro ☐
8. choose A for 300 Euro ☐ - choose B for 650 Euro ☐
9. choose A for 300 Euro ☐ - choose B for 700 Euro ☐
10. choose A for 300 Euro ☐ - choose B for 750 Euro ☐
11. choose A for 300 euro ☐ - choose B for 800 euro ☐
12. choose A for 300 euro ☐ - choose B for 900 euro ☐
13. choose A for 300 euro ☐ - choose B for 1000 euro ☐
14. choose A for 300 euro ☐ - choose B for 1200 euro ☐
15. choose A for 300 Euro ☐ - choose B for 1500 Euro ☐

For group C1 and T1 (C1A, C1B, T1).
ExpSan_8_C1_T1: Decisions Round II
You will now be given the opportunity to make your decisions. We show your choices between a simple and the comprehensive heating optimization, which differ only in price.

Now, for each of the 15 rows, please select the heating optimization that you prefer for the corresponding prices:
[Display options as Option A or B as described above.]
Option A: Simple heating optimization (Savings: final energy demand now - energy demand after simple optimization kWh/m2*a)

Option B: Comprehensive heating optimization (Savings: final energy demand now - energy demand after comprehensive optimization kWh/m2*a).

[**Infobutton:** Reminder: if you are drawn, your budget is 1500 EUR to spend on one of the options. The remaining part of the budget will be paid to you].s
[Three columns: Decision — Option A (Simple heating optimization) — Option B (Comprehensive heating optimization).
Answer options: For each decision situation, there are two answer options (boxes): one for "Choose A" and another for "Choose B"]

1. choose A for 300 euros ☐ - choose B for 300 euros ☐
2. choose A for 300 euro ☐ - choose B for 350 euro ☐
3. choose A for 300 Euro ☐ - choose B for 400 Euro ☐
4. choose A for 300 Euro ☐ - choose B for 450 Euro ☐
5. choose A for 300 Euro ☐ - choose B for 500 Euro ☐
6. choose A for 300 Euro ☐ - choose B for 550 Euro ☐
7. choose A for 300 Euro ☐ - choose B for 600 Euro ☐
8. choose A for 300 Euro ☐ - choose B for 650 Euro ☐
9. choose A for 300 Euro ☐ - choose B for 700 Euro ☐
10. choose A for 300 Euro ☐ - choose B for 750 Euro ☐
11. choose A for 300 euro ☐ - choose B for 800 euro ☐

12. choose A for 300 euro □ - choose B for 900 euro □
13. choose A for 300 euro □ - choose B for 1000 euro □
14. choose A for 300 euro □ - choose B for 1200 euro □
15. choose A for 300 euro □ - choose B for 1500 euro □

If NA = 0, but box (ExpSan_3) checked, so no participation in lottery: Exp_San_Alt_4_reasons - Exp_San_Alt_8.
[CA: control group [50%]
TA: treatment group [50%]]
ExpSan_Alt_4: Reasons
[Multiple choice]
For what reasons can you not imagine having a heating optimization done under any circumstances?

1. heating optimization has already been carried out
2. heating optimization cannot be carried out in my house for technical reasons
3. it is not my responsibility to have a heating optimization carried out
4. i do not want to make a decision now, which can have real consequences for me
5. other: TEXTBOX
6. don't know/not specified

ExpSan_Alt_4: Explanation We are about to present you with 15 hypothetical choices between two ways to reduce your home's final energy demand.

Simple optimization of your final energy demand involves minor retrofit measures, such as replacing window seals.

A **comprehensive optimization** of your final energy demand involves major renovation measures, such as replacing windows.

In each of the 15 rows, please select which option you would prefer for the prices provided.
ExpSan_Alt_5: Explanation II
For a better understanding we will now show you an example.

The table where you will enter your choices will look like the one shown below.

You will make your decisions only on the next page. In this table you cannot mark any options.
[Display the options as Option A or B as described above.]

Option A: Simple optimization (Savings: final energy demand now - final energy demand after simple optimization kWh/m2*a).

Option B: Comprehensive optimization (Savings: Final energy demand now - Final energy demand after comprehensive optimization kWh/m2*a)

7. choose A for 300 euro □ - choose B for 500 euro □
8. choose A for 300 euro □ - choose B for 550 euro □
9. choose A for 300 Euro □ - choose B for 600 Euro □

Each row of the table contains a decision to be made. In each decision, you choose either option A or option B.

- If you chose option B in row 8, you would prefer to have a **comprehensive optimization of your final energy demand** carried out at a cost of **550 euros**.
- If you chose option A in line 9, you would prefer to have a **simple optimization of your final energy demand** carried out at a cost of **300 euros**.

For group TA:
ExpSan_Alt_7_TA: Screen for treatment group
We would now like to give you more information on the savings potential of the two optimization options.

One possibility of such optimizations are heating optimizations. In Germany, the implementation of heating optimizations has been at a constant level for years.

- In the 1st half of 2017, 69,720 optimizations took place.
- In the 2nd half of 2017, 79,789 optimizations took place.
- In the 1st half of 2018, 71,248 optimizations took place.
- In the 2nd half of 2018, 77,987 optimizations took place.
- In the 1st half of 2019, 67,744 optimizations took place.

Source: Wuppertal Institute / arepo (2017).

For CA and TA:
ExpSan_Alt_8_CA_TA: Decisions Round II
You are now given the opportunity to make your decisions. We show you 15 choices between a simple and the comprehensive optimization of your final energy demand.

Now, for each of the 15 rows, please select the optimization that you would prefer given the corresponding prices:
[Display options as Option A or B as described above.]
Option A: Simple optimization of your final energy demand (savings: final energy demand now - final energy demand after simple optimization kWh/m2*a).

Option B: Comprehensive optimization of your final energy demand (Savings: final energy demand now - final energy demand after comprehensive optimization kWh/m2*a).
[Three columns: Decision — Option A (Simple heating optimization) — Option B (Comprehensive heating optimization). Response options: For each decision situation, there are two answer options (boxes): one for "Choose A" and another for "Choose B"]

1. choose A for 300 euros ☐ - choose B for 300 euros ☐
2. choose A for 300 euro ☐ - choose B for 350 euro ☐
3. choose A for 300 Euro ☐ - choose B for 400 Euro ☐
4. choose A for 300 Euro ☐ - choose B for 450 Euro ☐
5. choose A for 300 Euro ☐ - choose B for 500 Euro ☐
6. choose A for 300 Euro ☐ - choose B for 550 Euro ☐

7. choose A for 300 Euro □ - choose B for 600 Euro □
8. choose A for 300 Euro □ - choose B for 650 Euro □
9. choose A for 300 Euro □ - choose B for 700 Euro □
10. choose A for 300 Euro □ - choose B for 750 Euro □
11. choose A for 300 euro □ - choose B for 800 euro □
12. choose A for 300 euro □ - choose B for 900 euro □
13. choose A for 300 euro □ - choose B for 1000 euro □
14. choose A for 300 euro □ - choose B for 1200 euro □
15. choose A for 300 euro □ - choose B for 1500 euro □

Filter End Experimental Group II (EG II). From here on again for all:

5 Psychological control variables / environmental attitudes

PK_1: Now let's talk briefly about your views on the environment. How strongly do you agree with the following statements?
[Randomize]

Scale:

- Completely disagree (=1)
- Rather disagree (=2)
- Neither (=3)
- Rather agree (=4)
- Completely agree (=59
- Don't know/not specified (=-1)

Items:

1. People have the right to adapt the environment according to their needs
2. Humans severely abuse the earth
3. Plants and animals have the same rights to exist as humans
4. Nature is strong enough to cope with the impact of modern industrialized nations
5. Humans are destined to dominate the rest of nature
6. The balance of nature is very delicate and easily shaken

Locus of Control from EvalMap II

PK_2: In the following section, we would like you to indicate to what degree you agree with the statements on a scale from 1 (strongly disagree) to 7 (strongly agree).
[Randomize]

Scale:

- 1 Strongly disagree
- 2
- 3
- 4
- 5
- 6
- 7 Completely agree
- Don't know/not specified

Items:

1. I have little control over the things that happen to me

2. There is no solution at all to some of my problems
3. There is little I can do to change the many important things in my life.
4. I often feel helpless in coping with life's problems
5. Sometimes I feel that I am being bossed around in life
6. What happens to me in the future is largely up to me
7. I can do everything I really set out to do

Time Preferences/Altruism I (from World Preference Survey)

Altru_1: We are now interested in your willingness to act in a certain way in different areas. Please indicate your response on a scale of 0-10, where 0 means you are "not at all willing" and a 10 means you are "very willing."
[Scale 0-10 + response category "don't know/not specified"]

- How willing are you to give up something that is beneficial to you today in order to benefit more from it in the future?
- How willing are you to donate to a good cause without expecting anything in return?

Altruism II (as World Preference Survey)
Altru_2: Please imagine the following situation: You surprisingly receive 1000 Euros today. How much of this amount would you donate to a good cause?

1. NUMFELD: [0 to 1000 Euro]
2. don't know/not specified

Time preference II (from World Preference Survey)

Please imagine that you could decide whether you would prefer to be paid an amount of money now, i.e. a few days after completing the survey, or in 12 months.

How do we now show you five choices. The payment today is always the same for each of these choices. The payment in 12 months differs among the choices. Please choose in each case whether you prefer today's payment or payment in 12 months.

After the survey is completed, one participant will be drawn by lot. For this participant, one of the five decisions will be randomly selected and actually implemented, i.e., depending on the decision, a monetary amount of 100 euros will be paid out now or the other amount in 12 months.
[The second option varies, as illustrated in the following graph. In the first query, it corresponds to 154 euros. In the following question, X2 corresponds to either 125 or 185 euros, depending on whether the participant has chosen the amount paid in 12 months (B) or the amount paid today (A). The same logic is then used for the further selection of the amounts X3, X4, X5.]

PK_3_1 Time preference decision
Would you rather receive 100 euros today or 154 euros in 12 months?

1. 100 euros today
2. 154 euros in 12 months
3. don't know

[(also for the following) If don't know clicked, time preference part to end.]

PK_3_2 Time preference decision
Would you rather receive 100 euros today or X2 euros in 12 months?

1. 100 euros today
2. [X2 euros] in 12 months

PK_3_3 Time preference decision
Would you rather receive 100 euros today or X3 euros in 12 months?

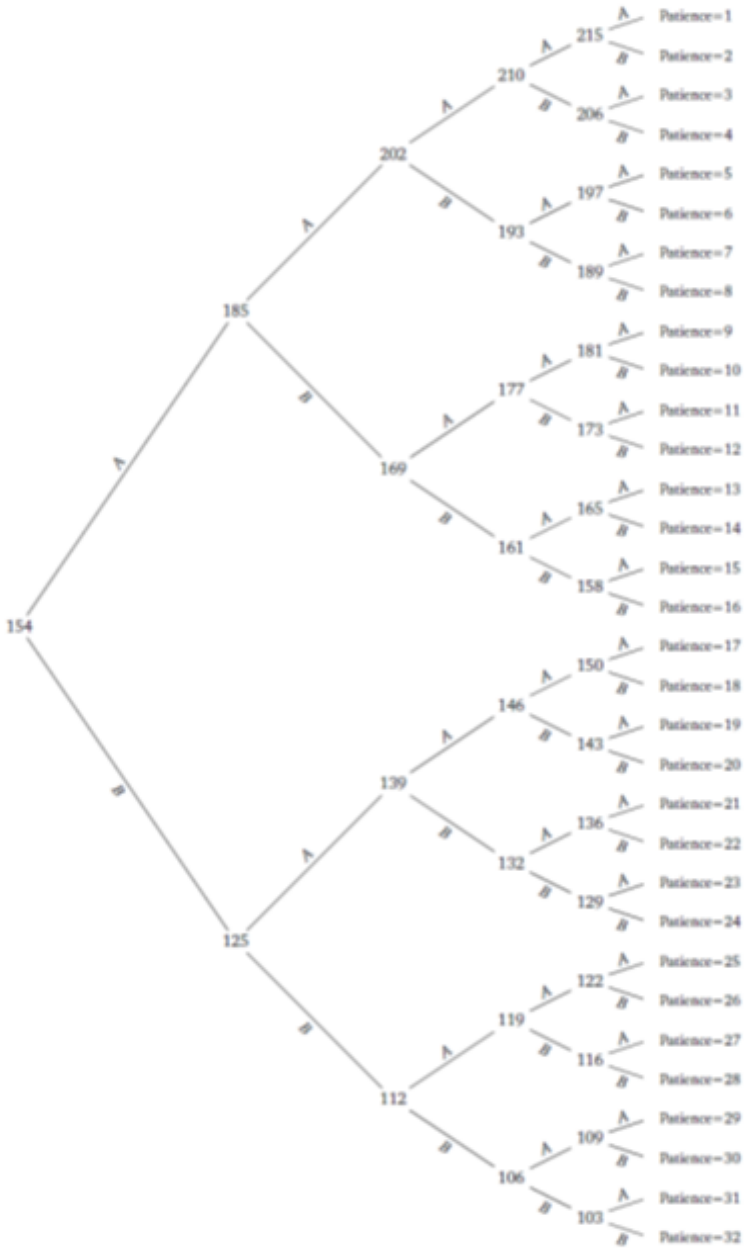
1. 100 euros today
2. [X3 euros] in 12 months

PK_3_4 Time preference decision
Would you rather receive 100 euros today or X4 euros in 12 months?

1. 100 euros today
2. [X4 euros] in 12 months

PK_3_5 Time preference decision
Would you rather receive 100 euros today or X5 euros in 12 months?

1. 100 euros today
2. [X5 euros] in 12 months


154
A
B
185
125
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202
169
139
112
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210
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Patience=30
Patience=31
Patience=32

6 Socio-economic data

Finally, please answer a few questions about yourself. Your data will be treated with absolute confidentiality in accordance with data protection regulations.

Question SO1: What is your highest school-leaving qualification?
[single answer]
Note: Please assign degrees obtained abroad to an equivalent German degree.

1. no degree
2. graduation after 7 years or less of school attendance (especially graduation abroad)
3. lower secondary school leaving certificate/elementary school leaving certificate
4. . secondary school leaving certificate (Mittlere Reife), polytechnic secondary school leaving certificate or equivalent qualification
5. entrance qualification for a university of applied sciences
6. general or subject-specific university entrance qualification (Abitur)
7. don't know/not specified

Question SO2: What is your highest vocational training or (technical) college degree?
[single answer]

1. no degree
2. apprenticeship or vocational internship of at least 12 months
3. vocational preparation year
4. apprenticeship, vocational training in the dual system
5. preparatory service for the intermediate civil service in public administration
6. vocational qualification from a vocational college/college, completion of a 1-year school in the health care sector
7. 2- or 3-year school of health care (e.g. nursing, PTA, MTA)
8. technical college degree (master craftsman, technician or equivalent degree)
9. vocational academy, technical academy
10. degree from a university of applied sciences
11. technical college degree, also engineering college degree
12. . degree from a university, university of applied sciences, university of the arts
13. doctorate
14. don't know/not specified

Question SO3: Which of the following applies to you?
[multiple answer]

1. I am employed or working (incl. trainees, persons on parental leave or partial retirement)
2. I am a pupil
3. I am a student
4. I am a pensioner, retiree

5. I live from income from capital assets, renting or leasing
6. I receive maintenance/allowances from my spouse, partner, parents, relatives or other persons - including persons from outside the household.
7. I am a housewife/ husband or I take care of children and/or persons in need of care.
8. I receive unemployment benefit I
9. I receive unemployment benefit II or social benefit (benefits according to Hartz IV)
10. I receive social welfare or basic income support in old age or in case of reduced earning capacity
11. none of the above options applies to me
12. do not know/no answer

If SO3=1, i.e. employed or working:
Question SO4: Employment is understood to mean any paid activity or activity associated with an income, regardless of the amount of time it takes. Are you...

1. employed full-time
2. employed part-time, for at least 20 hours per week?
3. part-time or hourly employed, with less than 20 hours per week
4. do not know/no answer

Question SO5: What is the total monthly net income of your household? This refers to the sum of wages, salary, income from self-employment, pension or annuity, in each case after deduction of taxes and social security contributions. Please also add income from public assistance, income from renting, leasing, housing allowance, child benefit and other income.

1. under 700 euros
2. 700 to under 1,200 euros
3. 1,200 to under 1,700 euros
4. 1,700 to under 2,200 euros
5. 2,200 to under 2,700 euros
6. 2,700 to under 3,200 euros
7. 3,200 to under 3,700 euros
8. 3,700 to under 4,200 euros
9. 4,200 to under 4,700 euros
10. 4,700 to under 5,200 euros
11. 5,200 to under 5,700 euros
12. 5,700 euros and more
13. don't know/not specified

Question SO6: In the last 10 years, have you or another household member received a large amount of money or related assets (e.g., real estate, car) through inheritance or gift?

1. yes

2. no

3. don't know/not specified

If SO6 =1, i.e. Yes:
Question SO6a: What was the approximate amount of this money/asset?

1. less than 5,000 euros

2. between 5,000 and less than 15,000 euros

3. between 15,000 and under 25,000 euros

4. between 25,000 and under 55,000 euros

5. between 55,000 and under 150,000 euros

6. 150,000 euros or more

7. don't know/not specified

If SO6 = 1, i.e. Yes:
SO6b: Was this amount of money/asset....

1. ...higher than expected

2. ...as high as expected

3. ...lower than expected

4. don't know/not specified

Question SO7: In politics, people sometimes talk about "left" and "right." Where on the scale of 1- 10 would you rank yourself if 1 is left and 10 is right?

Left									Right	Don't know / not specified
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	

Question SO8: In Germany, many people tend to vote for a certain political party for a long time, although they also vote for another party from time to time.
What about you: Do you - in general - lean toward a particular party? And if so, which one?

1. CDU / CSU

2. SPD

3. AfD

4. FDP

5. the left

6. Alliance 90 / The Greens

7. another party

8. no party

9. don't know/not specified

7 Consent

We would like to send you information based on the results of this survey by e-mail from time to time during the study period, i.e. over the next two years. Do you agree to this? If not, select "No, I do not want to receive any information". Otherwise, you can of course revoke your consent by e-mail at any time if you no longer wish to receive this information.

- I hereby consent to forsa sending me information based on the results of the survey by e-mail within the study period.
- No, I do not wish to receive any information.

Regardless of the answer to the question "Consent".
FINAL QUESTION
Finally, please briefly tell us if you had difficulty answering the questions at some points in the questionnaire (e.g., because the question was incomprehensible) or if other problems arose. If necessary, please describe this briefly.