Co-funded by the European Union

GETA

Gaming for Energy Transition of Rural Areas

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Deliverable D3.2 Research Report

Application of a combined indicator to assess the energy poverty

Developed by: All partners (Leader:ETMI)

Project Number	101091146
Grant Agreement	101091146
Work Package	WP3 Development of the GETA app
Deliverable Name	Research Report
Deliverable No	3.2
Deliverable Type	PDF Document
Dissemination Level	PU— Public
Document due date	28.06.2024
Date of submission	28.06.2024
Lead Beneficiary	ETMI
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Version History

Version #	Implemented by:	Revision date:	Approved by:	Approval date:	Reason:
0	LIFE	24.06.2024	ETMI	26.06.2024	Improvement of the report
1	ETMI	27.06.2024	All Partners	28.06.2024	Final Version

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Summary

The GETA project is co-financed by the European Union in the frame of the Erasmus plus program. The duration of the project is 24 months and it brings together six partners from Italy, Albania, Sweden and Bosnia Hercegovina. The main purpose of the project is to empower young people to become energy advisors and engage other young people from rural areas to identify, monitor and take actions for supporting energy transition of their territories.

The three main milestones of Task 3 were the preparation of the second research report, the international training course in Italy and the local events in each of the partner countries. During the local events, the project partners with the support of the rural youth, surveyed over 500 citizens about their perception and level of information regarding energy efficiency. The energy efficiency assessment was done through usage of 21 indicators from EU energy observatory HUB.

The methodology and the results of the survey in each partner's country are presented in this report. This report will be used as a baseline to be further capitalized into new initiatives and projects in each of the project countries.

One finding from the study is that the level of energy efficiency in the EU countries like Italy and Sweden is higher than in Albania and Bosnia Hercegovina. Another conclusion is that the energy poverty concept needs to be more mainstreamed to social policies and that governments need to pay more attention to energy poverty to support local citizens.

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I. Introduction

The GETA project is funded from the European Union Erasmus plus program and implemented by Life Foundation (Sweden), Marche Polytechnic University (Italy), Environmental and Territorial Management Institute (Albania) and Regional Center for Sustainable Development-REIC (Bosnia and Hercegovina). The duration of the project is 24 months. The main purpose of the project is to empower young people, called energy advisor with knowledge and information to be able to identify, monitor and take actions for energy improvement to their communities. Through the training they will be community leaders by engaging other people in the rural communities to be part of the energy transition process. The energy poverty is a sensitive topic in Europe and in particular to the Western Balkan countries.[1]

The project is planned to be implemented in several phases. The two main phases of the project are the international training program held in Italy were 21 young people participated and the preparation and test of the GETA webapp. The purpose of this report is to present the methodology used for the energy poverty assessment and the results obtained from the site visits in each participating country. The energy poverty assessment was carried out based on 21 indicators from the EU observatory Hub for Energy Poverty, which later were operationalized into questionnaires and were distributed to citizens.

The first result of the GETA project was the preparation of the first research report. The purpose of the research report was to give an overall picture of the energy poverty situation in each country. The outcome of the research report led to the development of the international training course where 24 participants from each country (4 participant per country) took part. The main topic of the training course was to equip young people with knowledge and principles regarding energy efficiency and how to deal with energy poverty mainly in the local communities. . After the training the youths have assumed the role of "energy advisors", thus being ready to further investigate the energy poverty situation. The energy advisors come from an energy background and have an interest in working on the energy topic. Moreover, the energy advisors supported by mentors, realized a 3- day training program related to energy poverty assessment and next four days the young people were engaged in data collection through usage of the GETA webapp.

The data collection was realized through usage of GETA webapp and the partner organizations analyzed the data and presented the result in the report.

[1] https://www.energy-community.org/regionalinitiatives/Transition/poverty/study.html

II. Methodology

2.1. Training of the energy advisors in Ancona

The training of the youths for carrying out the energy poverty investigation within the GETA project was held in Ancona, Italy, from **27/08/2023 to 02/09/2023** at the Department of Industrial Engineering (DIISM) of UNIVPM. The aim of the course was to educate youths of the current energy situation and scenarios in the EU and in the countries involved within the GETA project. In particular, the topic related to energy poverty has been mainly addressed, empowering the youths with the knowledge and tools capable of its assessment in their own countries using the energy poverty tool developed within the GETA project. In the end, the youths have assumed the role of "energy advisors", thus being ready to further move on with the investigation on the energy poverty situation.

Overall, the training was attended by 21 persons, while 5 persons overall from both UNIVPM and ETMI hold the lectures. Each GETA partner coming from Albania, BiH, Italy, and Sweden has assured the participation of at least 4 youths through a specific call for participation and subsequent CVs screening of the youths interested in participating to this course. At the end of the course, some of the youths that attended the training in Ancona, Italy, trained other youths living in specific local areas to become "energy advisors" as well, and carried out onsite activities in rural areas to evaluate the level of the energy poverty there. In particular, these areas have been selected in all the countries involved in the GETA project with a particular focus to Western Balkans since they are more affected by the energy poverty issue than EU ones.

2.1.1. Topics addressed during the training in Ancona

The main topics which were addressed during the training course in Ancona was as follow:

- **Day 1**

1) **Introduction to the course and of the participants (9:30 - 10:00):** in this lecture, UNIVPM welcomed the youths and introduced the course's speakers. An introduction of the course's content has been given to the youths and the main purpose of the course has been explained as well. In particular, the focus was on the energy poverty issue and its proper investigation through the energy poverty tool developed within the GETA project;
2) **Energy and statistics (global energy situation, energy roadmaps, energy use based on sectors, global environment impacts) (10:00 - 11:15):** in this lecture, an overview of the current energy situation worldwide has been provided to the youths along with the important deployment of renewables and energy storage systems. The current and future energy scenarios of different countries outside Europe have been analyzed and discussed as well;
3) **Energy and statistics: focus on Europe (global energy situation, energy roadmaps, energy use based on sectors, global environment impacts) (11:30 - 13:00):** in this lecture, an overview of the current energy situation in Europe has been provided to the youths along with the important deployment of renewables and energy storage systems. In addition, the main roadmaps, directives & legislations, and targets achievement by 2030 (32% of the overall energy consumption, per each country, covered

by renewables from RED II) and 2050 (net-zero gas emissions) from the European countries has been presented;

4) **From global to local environmental impacts due to current energy conversion systems (14:00 - 15:00):** in this lecture, a focus on the air pollution coming from fossil fuel-based energy conversion systems has been carried out. Indeed, the meteorological conditions strongly affect the spread of pollutants harmful for both the flora and fauna, and the conventional fossil fuel-based energy conversion systems (e.g., turbogas, steam plants, etc.) are the most contributors in the energy sector, meaning that a strong and fast decarbonization of this sector, such as transportation and hard-to-abate, is urgently needed;
5) **Energy conversion systems: history, basics of main thermodynamic principles, and how energy conversion systems operate (15:45 - 17:00):** in this lecture, the first kinds of energy conversion systems (e.g., fossil fuel-based) have been presented from a technical point of view. The main thermodynamic principles involved in each system have been shown and discussed in detail. Furthermore, technological and environmental limitations of these systems have been compared to renewables, if coupled with proper energy storage systems, and how much tCO_{2e} would be avoided with the added renewable capacity from nowadays till 2030.

➢ **Day 2**

6) **Energy and statistics: focus on Western Balkans (10:00 - 11:15):** in this lecture, an overview of the current energy situation in Western Balkans has been provided focusing on BiH and Albania which are the countries involved in the GETA project. In addition, the future targets related to the deployment of renewables and the decrease of the energy poverty issue through the direct implementation of specific measures, which are carried out by the local governments, have been discussed as well;
7) **Energy poverty concept and its main indicators and measures to tackle energy poverty (11:30 - 13:00):** in this lecture, an overview of the energy poverty issue worldwide and in Europe has been provided to the youths. A focus was given to those countries involved in the GETA project, specifically to Western Balkans where this issue is more widespread and stronger than European countries. In particular, the main indicators identified by the Energy Poverty Advisory Hub (EPAH) have been presented and discussed, also suggesting others that might be keener to analyses the current situation of Western Balkans;
8) **Field work methods (e.g., surveys, assessment, and community preparation) (14:00 - 15:00):** in this lecture, the youths started to get confidence with the activities to be carried out onsite for assessing the energy poverty level in each country involved in the GETA project. In particular, the methodology used for this purpose has been presented, as well as all the correct approach to use with people that will reply to the questions asked through the energy poverty tool developed within the GETA project;
9) **Working groups (case studies on energy poverty evaluation) (15:45 - 17:00):** in this lecture, the youths have started to discuss their opinions on the topics discussed so far. This part is important to get confidence with both the energy and environmental aspects. Then, the youths have started to work on specific case studies related to how energy poverty can be assessed and evaluated: this is crucial for having a good starting idea on how to proceed with its investigation in local areas.

➢ **Day 3**

10) **Renewable energy communities:** framework and renewable technologies (photovoltaics) (10:00 - 11:15): in this lecture, the current pathway to achieve the target of 32% of each country's energy consumption covered by renewables (RED II) has been discussed. In this regard, a particular focus on future renewable energy communities had been carried out. This approach is seen as a future perspective of increasing energy conversion systems that produce and consume energy locally, thus avoiding also electric losses that otherwise would have been in electric grids transmissions. Then, starting from a brief introduction of renewable technologies, the main characteristics of photovoltaics have been provided to the youths to i) give information on the calculation of the photovoltaic power capacities in specific places, and ii) provide useful hints for energy production calculation from photovoltaics together with a basic design procedure (e.g., coupling of an energy production site with a consumption one);
11) **Renewable energy communities: framework and renewable technologies (solar thermal and biomass) (11:30 - 13:00):** in this lecture, the current pathway to achieve the target of 32% of each country energy consumption covered by renewables (RED II) has been discussed. In this regard, a particular focus on future renewable energy communities has been carried out. This approach is seen as a future perspective of increasing energy conversion systems that produce and consume energy locally, thus avoiding also electric losses that otherwise would have been in electric grids transmissions. Then, starting from a brief introduction of renewable technologies, the main characteristics of solar thermal and biomass have been provided to the youths to i) give information about the calculation of the thermal power and biomass plants capacities in specific places, ii) different solar thermal panel and biomass technologies to be installed in specific places, iii) give useful hints for energy production calculation from solar thermal panels and biomass plants together with a basic design procedure (e.g., coupling of an energy production site with a consumption one);
12) **Renewable energy communities: framework and renewable technologies (water-energy nexus) (14:00 - 15:00):** in this lecture, the current pathway to achieve the target of 32% of each country energy consumption covered by renewables (RED II) has been discussed. In this regard, a particular focus on future renewable energy communities has been carried out. This approach is seen as a future perspective of increasing energy conversion systems that produce and consume energy locally, thus avoiding also electric losses that otherwise would have been in electric grids transmissions. Then, starting from a brief introduction of renewable technologies, the main characteristics of the water-energy nexus concepts have been provided. Indeed, water is essential for living beings, and its availability worldwide is decreasing due to climate change effects, particularly those places that have always suffered from water scarcity. Furthermore, water is important for energy production since hydropower plants can satisfy the baseloads of consumers and, at the same time, have an important role in enhancing grid stability;
13) **Renewable energy communities: framework and renewable technologies (local energy communities) (15:45 - 17:00):** in this lecture, the current pathway to achieve the target of 32% of each country's energy consumption covered by renewables (RED II) has been discussed. In this regard,

a particular focus on future renewable energy communities has been carried out. This approach is seen as a future perspective of increasing energy conversion systems that produce and consume energy locally, thus avoiding also electric losses that otherwise would have been in electric grids transmissions. Recent developments from the legislative point of view has been given to the youths to make them aware of the main pros coming from local energy communities, as well as understanding their current limitations in each European country.

- **Day 4**

14) **How to model simple energy systems - introduction with Aspen HYSYS (10:00 - 13:00):** in this lecture, some exercises with the Aspen HYSYS software have been presented to the youths. In particular, main conventional energy systems such as turbogas, steam plants, and combined cycles have been modeled. Aspen HYSYS is a commercial software used by several companies involved in both the energy and chemical sectors, with several features regarding the model of new "green" hydrogen-based technologies (e.g., electrolysis and fuel cells) that will have a pivotal role in decarbonizing hard-to-abate sectors together with the ongoing electrification process;
15) **Get started with the GETA tool and workgroups (14:00 - 15:00):** in this lecture, the youths have been introduced to the energy poverty tool developed within the GETA project with the aim of assessing the energy poverty level in the countries involved in the project. In particular, the main features and "how the tool works" has been discussed along with the target to be reached then by the onsite visits with the final GETA webapp (last part of the GETA project);
16) **Working groups (case studies on energy poverty evaluation) (15:45 - 17:00):** in this lecture, the youths continued the discussion started on the first working group lecture, now thinking about what has been said and done so far by adding the new knowledge acquired during the training course. Then, new case studies related to how energy poverty can be assessed and evaluated were presented.

- **Day 5**

17) **How to model simple energy systems - introduction with Aspen HYSYS (10:00 - 13:00):** in this lecture, some exercises with the Aspen HYSYS software have been presented to the youths. In particular, main conventional energy systems such as turbogas, steam plants, and combined cycles have been modeled. Aspen HYSYS is a commercial software used by several companies involved in both the energy and chemical sectors, with several features regarding the model of new "green" hydrogen-based technologies (e.g., electrolysis and fuel cells) that will have a pivotal role in decarbonizing hard-to-abate sectors together with the ongoing electrification process;
18) **Conclusions and remarks (14:00 - 15:00):** in this lecture, the sum up of what has been dealt within the course has been done. In particular, it has been stressed out the main goal of the course and the activities that the youths will carry out for assessing the energy poverty level in their own countries.

Figure 1: Photos taken during activities in Ancona, Italy

2.1.2. Activities after the trainings and follow up

After the training in Ancona, Italy, the youths have conducted preliminary surveys to people living in their own countries. At the first stage, the youths used the energy poverty tool for a preliminary assessment of this issue, starting to be confident with the future functionalities of the GETA webapp. Each partner has started this activity in a different period, achieving important results and interest by the people in this topic. Youths of each country had meetings with the respective project partners of the same countries to sum up the project results and plan the future activities, such as the youths' workers training and the onsite activities to be carried out in rural areas.

Then, the youths trained youth workers with which they have carried out onsite activities in rural areas to assess the energy poverty issue, namely in each country involved in the GETA project. In this case, the GETA webapp has been used with all the final functionalities implemented. Finally, all the youths involved in the project met with each partner for a final briefing on the results obtained by providing some feedback and suggestions to provide to the people to enhance their energy behavior and situation about local energy production, if any, and consumptions.

2.2. Description of the GETA webapp and the indicators

The development of the GETA app is based on the list of energy poverty indicators listed in the EU Energy Poverty Observatory (EPOV). Prior to the development of the GETA app, the project partners developed and tested the energy poverty through GETA tool[2]. The list of indicators presented are summarized as below:

1. Arrears on utility bills
2. Inability to keep home warm
3. Household electricity price
4. Household has price
5. Population living dwelling with presence of leak, damp, rot
6. At poverty risk or social exclusion
7. Number of rooms per person per ownership status.

By using this tool, it is possible to provide a survey, based on some indicators found from EPAH and others proposed during the GETA project, capable of assessing the energy poverty level in each county involved in the GETA project. It follows the 21 questions[3] asked through the tool and the webapp along with the multiple answers:

Subsequently, starting from the energy poverty tool, the GETA webapp[4] has been developed and it can be accessed upon requestion of permission. The GETA webapp needs credentials to be accessed by the GETA project partners (user: admin; password: revoltgeta2024). Once entered, the final version of the questionnaire is displayed. In the fig is shown the structure of the GETA webapp.

Together with all the partners of the GETA project, it has been decided to develop a webapp instead of a conventional app for the following reasons:

- Several options/analyses can be set in the webapp to get more details from the answers coming from the survey than a classic app, and it is also easy to handle with;
- There is a cost for downloading the app (e.g., using Play Store) which has to be justified by the number of people that download it. The website is more user-friendly and easier to manage, also allowing to attract more people coming from different countries;
- The possibility to reach out more people coming from different countries worldwide is a plus since it enhances results coming from the GETA project and provides more data, differentiated by country, to work with.

[2] https://docs.google.com/forms/d/e/1FAIpQLSenkQZ6ALqQGoFkz9xbLUlNQ2Kp-CpoenT-Cboi8hEs0p2xrg/viewform

[3] Operationalization of indicator into questions is introduced in Annex 1 – List of questions.

[4] https://www.revoltsrl.com/login-energy-survey

2.3. Limitations of the study

One of the limitations of the study is the assessment of all the indexes reported by EPAH; indeed, some of them have not been considered appropriate to be used in this investigation for the following reasons, and thus new ones have been proposed. In particular, the reasons are the following:

- The need to have detail technical characteristics/information about the house and the main energy conversion technologies/home appliances which is not always easy to retrieve, especially in rural areas, where, generally the level of instruction is not so high (compared to the current average in other countries) and the age of the people is high as well with limited or no knowledge on how to use new technological devices;
- The need of energy consumption, and eventually production, values which might help to provide details for giving the right suggestions to the people in lowering their energy consumptions as well as providing the right suggestions from experts;
- The increase of people's awareness on the energy poverty issue. Although most of them have shown interest in this topic there is still a considerable percentage that is not cognizant of this problem and how many people are affected;

Finally, by considering these limitations and how to overcome them, it will be possible to further develop the GETA project and provide specific and clear suggestions and directions to the people interviewed, which will benefit by having a better picture of what is required or not to increase energy efficiency in buildings, depending on the location and country, and what are the main area of intervention in which moving further.

III. Albania

3.1. National Energy and Climate Plan

3.1.1. National targets (CO2 reduction targets and energy poverty)

In 2018, Albania adopted the **National Energy Strategy for the period 2018–2030**. The National Energy Strategy 2018–2030 is the main strategic document for the country's energy sector. It is in line with national efforts to support economic development and fulfill commitments under the Energy Community Treaty, the EU integration process and other international agreements, increasing security of energy supply and minimizing environmental impacts with affordable costs for Albanian citizens and all sectors of the economy.

In December 2021, Albania adopted the "**National Plan of the Republic of Albania for Energy and Climate 2021-2030 (NECP)**". The 2030 objectives are an intermediate step towards the long-term commitment to the objectives set by the EU for a climate-neutral continent by 2050. The Government of Albania approved the first version of the LAPEE on December 29, 2021. Objectives set until 2030 include saving carbon emissions of 18.7%, a reduction in final energy consumption of 8.4%, and the use of renewable energy with a value of 54.4%.

Figure 2 Targets on CO2 reduction and final energy consumption

Target (2030)	Contribution of sectors		
Reduction of carbon emissions: - 18.7% (only for the energy sector. Total is 26%			**18.70%**
Greenhouse gas emission targets (kt CO2 equivalent):	Greenhouse Gas Emissions (kt CO2 equivalent) predicted with additional measures until 2030		
	Energy consumption/demand	4833	
	Transformation	250.8	
	Industry, waste	5139	
Energy Efficiency (Reduction of final energy consumption): - 8.4%			**8.40%**
Final energy consumption (ktoe) target:	Final energy consumption (ktoe) projected with measures for 2030.		
	Residential	348.9	
	Services	195.2	
	Industry	542.4	
	Transport	1003.4	
	Agriculture and forestry	110.5	
	Fishing	56	
	Not Energy	70.6	
Use of renewable energy in final energy demand: 54.4%			**54.40%**
Renewable energy coverage target	The coverage ratio of energy demand from renewable sources (percentage) in the projection with additional measures until 2030.		
	RER – Electricity	178.1 %*	
	RER -Transport	34.60%	
	RER-heating, cooling	16.60%	

3.1.2. Local targets (CO2 reduction targets and energy poverty)

According to Energy Efficiency Law (revised in March 2021), it is clearly stated that all municipalities must prepare Municipal Energy and Climate Action Plans to be in convergence with the National Energy and Climate Action Plan (NECP) including savings clear energy at the local level. Contribution of renewable energy sources and CO2 reduction targets for each of the direct sectors including public buildings, public

lighting, solid waste collection and management, water supply, sewage treatment plants, public transport and all other municipal services as well as other sectors such as residential, commercial, etc.

Starting on February 28, 2022, every three (3) years, municipalities will prepare and submit to the Energy Efficiency Agency (EEE) draft municipal energy and climate action plans which will include proposed policies and measures for improving energy efficiency and climate, which cover all sectors operating at the municipal level. Municipality of Kavaja have drafted the **Sustainable Energy and Climate Action Plan (SECAP)**. ETMI has supported the municipality in collecting the data and developing the final energy consumption calculations and emissions. Based on the data collected in the municipality of Kavaja, the number of families turns out to be **20,195 families**. Out of these, were about **32.2% live in multi-apartment buildings,** while the remaining **67.8% live in individual private houses**.

The collection of data for the residential sector was provided by the Distribution Electricity Operator (DEO) in the municipality of Kavaje. The data on electricity consumption are provided according to 2 categories of buildings (multi-family house, individual housing). Electricity consumption is recorded on a monthly basis. From the data collected, it is observed that the consumption of electricity in individual dwellings is higher than multi-family houses. This is due to level of energy losses present in the individual housings rather in multi-family houses. apartments, part of the living spaces is shared and the energy losses are in smaller values. Electricity from the residential sector is mainly used for heating/cooling the premises, lighting and cooking. The heating of the apartments is mainly done with electricity and a small part of them with firewood. Regarding electricity consumption rates, the price of energy for household consumers is 9.5 ALL/kWh.

Figure 3 Energy Consumption in last three years in residential sector

Residential Sector	**Year 2020 (kWh)**	**Year 2021 (kWh)**	**Year 2022 (kWh)**
Multi-family house	15,022,909	27,106,159	7,278,538
Individual housing (dwellings)	29,661,521	44,421,837	26,263,346
Total (kWh)	**44,684,430**	**71,527,996**	**33,541,884**

In the following paragraph are shown the energy savings targets and carbon emissions for the residential sector referring to the Baseline Scenario (no implemented measures) and active scenario (implemented measures as proposed from the SECAP). The results of the base scenario (without measures) and the one with measures are presented below. Referring to the base scenario, there will be an increase in energy consumption by **15%**. This will come as a result of the increase in the intensity of energy consumption. In 2022, energy consumption is estimated at **72 GWh**. In the case of taking measures to reduce the final energy consumption, this would be with a reduction of about **10%** compared to the base year (2022).

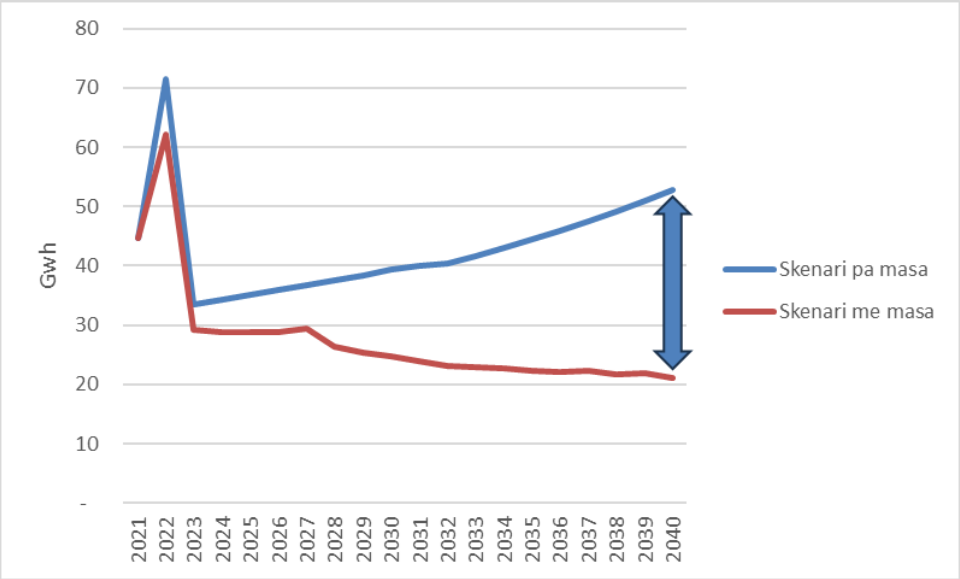


Figure 4 Energy saving potential of residential buildings (GWh)

The results of the base scenario (without measures) and the one with measures are presented below. Referring to the baseline scenario, there will be an increase in carbon emissions by **15%**. This will come as a result of the increase in the intensity of energy consumption. In 2022, carbon emissions are in the value of **16,980 tons of CO2** and in 2040 this value is expected to reach about **20,078 tons of CO2**. In the case of taking measures to reduce the carbon level, this would be with a reduction of about **50%** compared to the base year (2022).

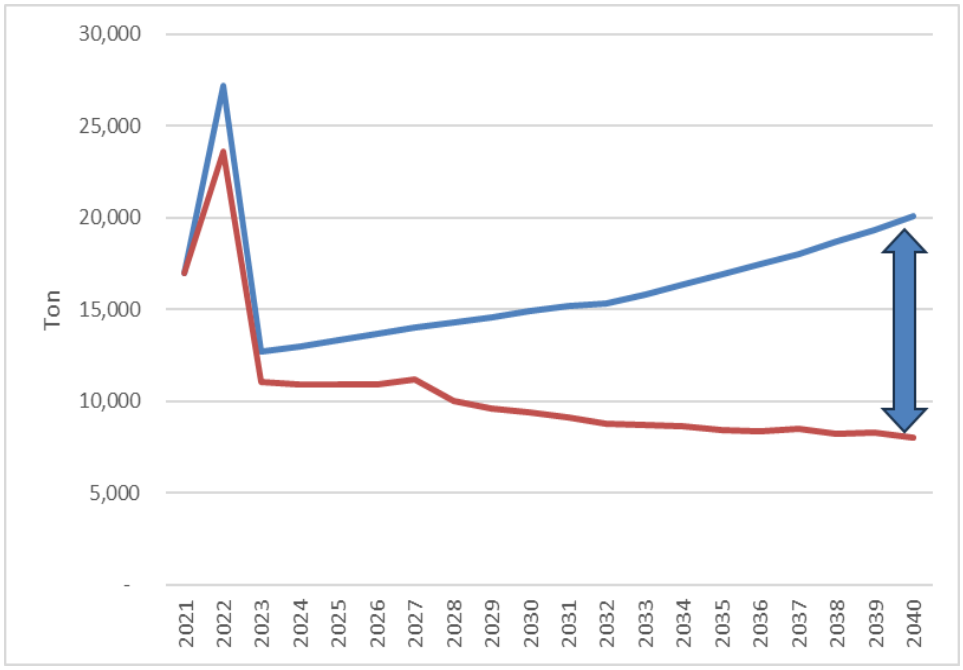


Figure 5 CO2 reduction potential (tons) from residential buildings

3.2. Case study

3.2.1. Description of the area

The municipality of Kavajë is part of the western lowlands of our country. The municipality of Kavaja lies in an area of gentle hills and fertile plains around the city of Kavaja, up to the Adriatic Sea, where there are partly sandy and partly rocky beaches. The municipality of Kavajë is bordered by the municipality of Durrës in the north, with the municipality of Tirana in the east, with the municipality of Rrogozhinë in the south and with the Adriatic Sea in the west. The total area of Kavajë Municipality is 198.81 km2.

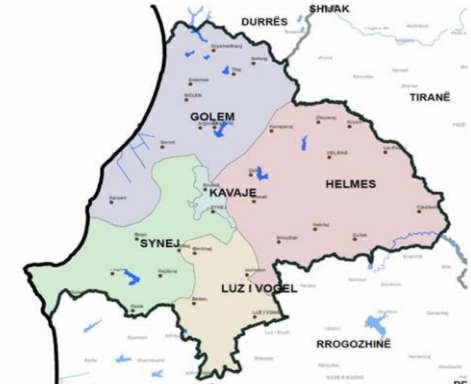


Figure 6 Map of Kavajë Municipality

The center of this municipality is the city of Kavaja. The new municipality consists of five administrative units which are: Kavaja, Synej, Luz i Vogël, Golem and Helmas. All of them are part of Kavajë District of Tirana District. The new municipality has a town and 32 villages.

Figure 7 Administrative Division for Municipality of Kavaja

Name of the Unit	Cities and villages in their composition
Kavajë	City of Kavajë
Synej	**Villages**; Synej, Butaq, Rrikaj, Hajdaraj, Peqinaj, Rrakull, Bago
Luz i Vogël	**Villages;** Luz i Vogël, Vorrozen, Beden, Blerimaj
Golem	**Villages;** Golem, Kryemëdhej, Tilaj, Seferaj, Golemas, Qerret, Karpen, Zik-Xhafaj, Kanaparaj, Agonas, Karpen i ri
Helmas	**Villages;** Helmas, Zikular, Lis-Patros, Shtodhër, Çetë, Momël, Habilaj, Çollakaj, Kryezi, Cikallesh

According to the 2011 Census, Kavaja has a population of 79,141 inhabitants, while according to the Civil Registry this municipality has 79,032 inhabitants. With an area of 198.81 km2, it has a density of 201 inhabitants/km2 according to the census and 400 inhabitants/km2 according to the civil registry.

Today, the municipality of Kavaja has a very low density of urban areas both in terms of population (32.3 b/ha) and residential units (9.3 b/ha). This fact is also based on a high percentage of unoccupied flats, 14.9% (Instat). On the other hand, in the current housing stock, about 21% of them are depreciated due to their quality and age. Many residential areas have been developed along road axes and on agricultural lands, having a negative impact on both agricultural production and the quality of life of residents, who, especially in areas near streams, are at constant risk of flooding. This extension with low density and in areas vulnerable to environmental risks results in a degradation of the territory that makes it difficult to provide infrastructural and social services. Urban areas in the territory of the municipality of Kavajë must have a density of housing units of at least 100-200 ui/ha in order to have an average urban density to justify investments in infrastructure and public services.

3.2.2. Training of local rural youth about energy poverty assessment

The ETMI staff in partnership with Municipality of Kavaja as partner of the project conduced the training of 20 youth from rural areas in Municipality. The energy advisors, who have already participated during the training course in Ancona, shared with the participant the scope of the assignment and the methodology that will be followed from the youth. The youth, were informed about the definitions and concepts of energy poverty. The project partners informed the rural youth about the target areas where the survey will take place and the methodology that will be followed from the rural youth.

During the first day of the training, the rural youth gained knowledge about the energy poverty definition, main factors for energy poverty, vulnerable groups and gender role in energy poverty. After the theoretical session, young people were engaged in working groups. They determined the daily household schedule routine and energy consumption based on the gender role.

On the second and third day of the training, the participants were informed about key strategies and related interventions to tackle energy poverty in their local areas. The energy advisors presented the GETA tool and GETA web app to the young people and all the instructions on how to use it during the field work.

After completing the training sessions and familiarizing themselves with the GETA web app, participants carried out surveys among households in three Administrative Units (Helmas, Luz and Synej) within the Municipality of Kavaja. A total of 215 households were visited, all of them responding, providing significant insights into energy-related issues and requirements within the community.

In the Fig 9 and 10 are shown photos of the houses which were part of the site visit. The quality of the houses from the outside looks in poor conditions, like the façade and window typology. In the internal walls were found moisture and poor conditions.

Figure 8 The training activity in Kavaja, Albania

Figure 9 Building typology in Kavaja Municipality

Figure 10 Building Typology in Kavaja Municipality

3.2.3. Results and findings of the site visit (indicator analyses)

According the information provided from the questionnaires (240 respondents in total) the following answers where obtained:

- **33% of the respondents** were in the range of age 41-60 years old. **23 %** were in the range of 61-80 years old and only 3% of the age 20 years old or younger. This information reveal that the average age of the local population is in the range 41-60%. Moreover 23% of the responded population varies between 61-80 years old. This information informs that the local population is quite vulnerable to the energy poverty.
- **70% of the respondents** were man and 29% of the respondents were women and 1% did not prefer to share his/her age.
- **33% of the interviewers responded**, the breadwinner has a gymnasium, 26% has high school education, 21% bachelor degree education, 12 % as master degree education and only 12 % with lower than upper of secondary education. Most of the respondent have medium level education.
- **78% of the interviewer** responded they live in an individual house (dwelling), and 17% live in multi-family house. According the SECAP, the highest energy consumption comes from individual houses. Referring to this data, we conclude that the energy consumption in individual houses is high.
- **32% of the interviewers responded** they live with 4 people in their space, 26% live with 3 persons, 16% live with 5 persons, 13% with more than 5 persons and 12% with only 2 persons.
- **66% of the interviewer**, responded they have 2-5 rooms in their apartment, 29% responded they have more than 5 rooms and 5% have only 1 room. If we make the ratio number of room per person, we estimate that value is 0.5 room per person. In case we compare with the EU references the value is 1.5 (room/person). According the definitions, the energy poverty is linked as well with size of dwellings. From the information received we conclude that the dwelling size is quite small comparing with the number of people living in this area.
- **39% of the interviewers responded**, the age of their building is 25-35 years old, **30% responded is 36-60 years old**, 6% responded is older than 60 years and 25% responded is less than 25 years. From this information we conclude that the age of the buildings is average.
- **73% of the interviewers**, responded that they own their house with a mortgage, 15% responded without mortgage and only 12% with tenancy. This information informs us that the majority of the population is paying monthly mortgage and this triggers poverty situation of the local population.
- **39% of the interviewers**, responded they are neutral regarding the level of energy efficiency/comfort during summer time. 24% responded they unsatisfied, 20% responded are satisfied and only 8% very unsatisfied.
- **28% of the interviewers**, responded they are neutral regarding the level of energy efficiency/comfort during winter time, 30% responded are unsatisfied. The highest majority of the local population is not satisfied with the level of comfort.

- **28% of the interviewers**, responded they are neutral regarding the level of energy efficiency, **25% responded are unsatisfied** and only 10% very satisfied.
- The majority of the local population is heated by electricity and 25% of them have issues with window frames or floor.
- **25% have responded the energy bill is unaffordable**, 26% answered the energy bill is affordable and 49% are neutral.
- **40% of the interviewers responded** that their incomes that goes for the energy bill is **30% of the overall salary**, 24% responded is more than 30%, 21% responded don't have this information and 15% less than 10% goes for energy bill.
- **48% of the interviewers responded** that they sometimes have delays with energy bill, 45% responded never and 7% responded always have delays with payment of the energy bill.

IV. Italy

4.1. National Energy and Climate Plan

4.1.1. National targets (CO2 reduction targets and energy poverty)

Despite other EU countries such as France, Germany, and Spain, Italy does not have a national economy-wide emissions reduction target in addition to its contribution to the EU targets. Indeed, in March 2022 Italy's Plan for the Ecological Transition (PITE) was adopted including a non-binding emissions reduction target of 51% below the 1990 levels by 2030.

Italy's final National Energy and Climate Plan (NECP) sets a 2030 reduction target for GreenHouse Gas (GHG) emissions, along with CO_2 emissions reduction not covered by the EU emissions trading system (non-ETS), at 33% below 2005 levels by 2030. In the near future, this target will change through the negotiations on the "Fit for 55" Package at the EU-level which is redefining EU Member State targets with Italy's revised Effort Sharing Regulation (ESR) target raised to 43.7% below 2005 levels.

Italy's 2030 emissions reductions target based on its integrated NECP results in 30% emissions reduction below 1990 levels. The 2021 Economic and Finance Document of the Finance Ministry (EFDFM) shows an updated projection that leads to higher reduction cuts than the NECP targets, namely 49% emissions reduction below 2005 levels by 2030 and 42% emissions reduction below 1990 levels by 2030.

On the contrary, Italy needs to reduce GHG emissions by 61-71% below 1990 levels and reach 149-201 $MtCO_{2e}$ by 2030 to be in line with 1.5°C compatible pathways. In this regard, Italy needs to double its targeted emissions reduction, compared to those outlined in its NECP, between now and 2030 to be aligned with 1.5°C pathways[5].

Regarding the energy poverty issue, in 2021 there were over 2.2 million families facing this problem, equal to 8.5% of the total families based on the official measure adopted with the 2017 National Energy Strategy

[5] https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/690663/EPRS_BRI(2021)690663_EN.pdf.

(NES) in the 2020 Italian NECP and in the Annual Report 2023 by Istat. In the 2020 NECP, the objective was to reduce energy poverty by 2030 in a range between 7 and 8% of the total families. So far, in Italy there are 3 types of policies to tackle the energy poverty issue: i) reduce energy expenditure with bonuses and deductions; ii) improve energy efficiency by applying regulations, tax benefits, energy performance certificates, energy tutors; and iii) provide subsidies to support low-income families[6].

4.1.2. Local targets (CO2 reduction targets and energy poverty)

Moving to the local targets, namely those related to the Marche region, the per capita value of GHG emissions in 2016 was equal to 4.87 tCO_{2e}, which was lower than the national average value of 7.1 tCO_{2e} and EU of 8.41 tCO_{2e} in the same year. In particular, 11 sectors have been analyzed in the same year, highlighting that the "road transport" one is the main contributor of GHG emissions along with "non-industrial combustion" and "industrial combustion". In the Marche region, a total of greenhouse gas emissions equal to 5,916,598.52 tCO_{2e}/year has been recorded in 2016. Regarding the CO_2 emission targets to be achieved by 2030, the Marche Region is aligned with those of the EU, but with a focus on: i) GHG gas emissions; and ii) make the EU more resilient to climate change. It is worth noting that only data from 2016 to 2019 are available since the new document that sums up results from 2020 to 2023 is being currently written and released by the end of 2024.

Moving to the energy poverty issue, the Marche region has economically contributed to provide financial help to those people/families that struggle to have acceptable normal life conditions, which accounted for about 4000 families in 2022. In this regard, in the same year the Marche region has allocated 100 k€ to poor people with serious health conditions to support them in paying electricity and gas bills. In 2023, the Marche region was allocated 2.5 M€ to reduce the energy costs of low-income families. The contributions have financed energy production interventions from renewable sources and for the improvement of the energy efficiency of domestic electrical and heating systems, serving residential real estate units. The beneficiaries were focused on people/families with a gross yearly income lower than 40 k€, owners of the buildings affected by the intervention.

4.2. Case study

As discussed in the previous subsection, the energy poverty issue is present in the Marche region that has provided, and it is still providing, financial help to poor people/families as well as pushing to energy efficiency in buildings and deploying renewables. Indeed, most of these people/families that are facing energy poverty live in rural areas without, or with limited access, to the electricity grid; so, the possibility of empowering them with these technologies is fundamental to make them self-produce and consume energy locally for carrying on their own lives properly. Also, the level of energy poverty increased in small villages located in the hinterland of the Marche region due to the damages caused by the important earthquake of 2016 in the center of Italy.

Although the energy poverty issue in Italy is known and important measures have been taken so far also locally, as previously demonstrated by the Marche region, the need to further contribute in the identification of those indexes capable of easily and efficiently monitoring its status, as well as targeting

[6] https://oipeosservatorio.it/en/home-en/.

the main actions to lower the energy poverty extension, is of pivotal importance. Within this scope, the GETA project aims to provide a clear methodology to assess energy poverty at different scales.

Università Politecnica delle Marche (UNIVPM) is one of the project partners and has organized the training school of youths, coming from each GETA project partners' countries, in Ancona, Italy, in 2023 to train them how assessing the energy poverty level in their own countries (e.g., Albania, BiH, Italy, and Sweden). In particular, the energy poverty tool, which has been developed within the project as a first version of the GETA webapp, has been shown and explained to the students along with its functionalities to carry out preliminary surveys to local people to measure their eventual energy poverty level, then consolidated through the GETA web app developed by UNIVPM and released on March 2024 for onsite investigations. In particular, the energy poverty tool has been used by some students of UNIVPM coming from different parts of the Marche region to address the energy poverty situation on a regional scale.

The survey was carried out in May 2024 (precisely from the 1st to the 10th of May) by Filippo Onori, one of the youths that participated to the international training school together with Lorenzo Giannetti, Marco Fabio Lametti, Melani Morina, and Enrik Xhani that are/were students of master of science in energy and mechanical engineering at UNIVPM. The survey was carried out both at the main entrance of the Faculty of Engineering-UNIVPM and in its classes in Ancona, Italy, asking to the people involved to make it circulate also among their families/relatives. Overall, 59 responses were collected, showing an open spirit from the students to provide useful information and contribute to the achievement of the GETA project's objective.

4.2.1. Description of the area

A preliminary analysis and assessment of possible places for measuring the energy poverty level in the Marche region has been carried out between the UNIVPM team involved in the GETA project and the students who participated in the training in Ancona, Italy. Besides starting with the results obtained with the energy poverty tool used by the students at UNIVPM, which are shown below, the main focus is to organize onsite activities and, especially, target the locations to be considered for carrying on the energy poverty investigation. Finally, some municipalities located in the hinterland of the Marche region have been selected, particularly those that have been affected by the earthquake occurred in the center of Italy in 2016. Figures below show the maps of the involved municipality, whose name is Visso (MC).

Figure 11 Position and Location of Municipality of Visso in Italy

As previously said, considering the ongoing collaboration between UNIVPM and municipalities located in the hinterland of the Marche region which unfortunately were victim of the important earthquake in 2016, it has been decided jointly to focus on this area to carry on the energy poverty investigation. To perform this action, the GETA webapp developed in March 2024 has been used. The same app has been also employed by the other project partners to carry on questionnaires in their own countries.

4.2.2. Training of local rural youth about energy poverty assessment

UNIVPM organized a student's/youth workers' training school in Ancona, Italy, on 27-28/05/2024. The following photos shows picture which has been held by Dr. Mosè Rossi, Ph.D., and Eng. Filippo Onori, current Ph.D. student @UNIVPM that has also participated to the training of the youths in Ancona, Italy, 2023.

Figure 12 Photos taken during the local training in Ancona

Besides detail information about the training has been written in Section II of this document, the aim of the course was also to provide the students/youth workers with:

- an overview of the current energy situation in Europe and in each country of the GETA project partners along with future targets to be achieved globally and locally;
- a description of the energy poverty issue in Europe and in each country of the GETA project partners, with a particular focus on the main indexes to be used for its proper and fair evaluation;
- Information on how to use the energy poverty tool developed within the GETA project, as well as the GETA webapp released on March 2024, and which results are obtained at the end of the questionnaires' filling.

Then, the students/youth workers trained by Dr. Mosè Rossi, Ph.D., and Eng. Filippo Onori, which were recognised as "energy advisors", have provided the questionnaire to the municipalities located in the hinterland of the Marche region to obtain significant data and results in those areas. Results regarding this investigation are reported in the next sub-subsection.

4.2.3. Results and findings of the site visit

After the collection of 100 responses, the post-processing of the obtained results has been carried out. The survey was carried out in a municipality located in the hinterland of the Marche region, asking people/families if they wanted to participate in a survey about the building status and energy use in their houses. Interviewed people/families were immediately interested in replying to the questionnaires, and

curious about the possible suggestions coming from the results. To provide a better overview of the current situation in Italy regarding the building's status, according to Eurostat, almost 54% of residential buildings were built before 1970, compared to a European average of 44.8%. However, Italy is not the European country having the oldest buildings; for instance, Sweden, Denmark, and Belgium have got 64.4, 62.4, and 61.3% of residential buildings built before 1970, respectively, while other countries like Germany and France are aligned with Italy having 53.6 and 52.7% of residential buildings were built before 1970, respectively.

How polluting can a building be? It certainly depends on its energy class which is defined on the basis of a classification that goes from the most efficient houses (class A, with a consumption of no more than 30 kWh/year per m^2) to the least efficient ones (class G, over 160 kWh/year per m^2); generally, class D is considered sufficient by the modern standards. The energy class is assigned with the energy performance certificate, which is not owned by all the buildings since it is only needed in the case of sale or rental of the property, or in case building bonuses are requested for the planned renovations. According to the ENEA data (the National Agency for new technologies, energy and sustainable economic development) 3.4 million out of 4.9 million energy certificates certify properties in the lowest energy classes and below the D, i.e. E, F and G, the ones on which energy efficiency interventions are currently focused on. Always ENEA in 2023 recognized that, in recent years, there have been improvements in the energy efficiency of buildings, also resulting from building bonuses.

In 2022, the share of properties classified in the least efficient energy categories, F and G, reduced by almost 3.7% and, at the same time, those belonging to the best categories, A and B, increased thanks to new constructions. To provide a better view of the building’s status in the area where the local activities have been carried out, the following pictures show some images of their external status. As it can be noticed, three different buildings’ status can be observed: the first is in a very good condition (left-top) the second is in a good condition (left-bottom) and the third is in a decent status (right-up)

Figure 13 Left-up photo: Building in very good conditions, Left below: In good status, Right: Low quality

After showing the houses' status level in Italy, the results of the carried-out survey by using either the energy poverty tool or the GETA webapp are reported in Annexes II and III. A brief recap and some considerations about the answers are reported in the following:

- **40% of the respondents** are between 21 and 40 years old, as well as less than 20;
- **45% of the respondents** say that the breadwinner(s) have a Master's degree, followed by 35% that have a high school diploma;
- **85% of the respondents** live in an apartment;
- **55% of the respondents** stated that four people are living in their home, while 20% of them replied that only 2 people live in their home;
- **55% of the respondents** have 2-5 rooms in their home, while the remaining ones have more than 5 rooms;
- **35% of the respondents** live in a building with an age lower than 25 years and 30% live in a building with an age between 36 and 60 years;
- **65% of the respondents** live in their own house without a mortgage;
- **30% of the respondents** replied that are satisfied with the level of comfort in their houses in summer, and the same percentage stated that are neutral;
- different results, instead, regarding the level of comfort in winter where 60% is satisfied;
- **40% of the respondents** said that they are neutral about the level of energy efficiency of their home, while 35% are satisfied;

- the same trend as before is recorded for the energy efficiency of the home device: in this case, 60% are satisfied and 25% are neutral;
- the majority of the respondents use gas as a heating source (90%) and as a cooking source (95%);
- **the majority of the respondents (90%)** do not have problems with their houses;
- 55% of the respondents are not affected by the energy costs in their houses; indeed, there is equity between those who spend less than 10% of their incomes in paying energy bills (35%) and those who spend between 10 and 30% of their incomes;
- an important percentage **of the respondents (45%) stated** that they are late in paying the energy bills, followed by 40% that are never late in paying them.

Results showed that there is a good level of knowledge and application of energy efficiency rules in Italy's houses, although the majority of them still rely on the use of gas (e.g., fossil fuels) for energy needs and most of the buildings are relatively old (between 36 and 60 years). This last outcome is aligned with the general picture given at the beginning of this chapter where most of the houses in Italy are old. Several actions should be taken by the Italian government to renovate buildings in Italy, especially with the aim of achieving the targets imposed by the EU through the Renewable Energy Directive (RED III) published at the end of the last year by pushing on the electrification of the residential sector fueled with more renewable energy sources such as photovoltaic and wind.

Another important aspect to highlight is the high percentage of people having their own house. Among the European countries, Italy is the one with the highest level of own properties, whose origin come from the past generations and today's people have inherit them from their parents. As a results, people with their own houses can directly intervene in them if something is wrong and, for this reason, 90% of the respondents stated that they are satisfied with their status either if they have or not a mortgage. Certainly, people who have to pay rent are less interested in spending money for renewing the house where they live.

Another important aspect regards the money spent by people on energy bills; as can be noticed, most people have no problems paying energy bills although the majority stated that they are always late in paying it. This point is crucial because governments should sustain citizens in affording the payment of energy bills in time.

Finally, a good percentage of people does not know about energy expenditure in their house, meaning that only the breadwinner(s) is/are managing the energy costs without relying in other people living in the apartment/house. This means that not all the families are aware of the amount of money needed to pay energy bills, which does not help in performing energy efficiency although, as previously said, results obtained so far showed a good level of knowledge and application of energy efficiency rules by Italians.

V. Sweden

5.1. National Energy and Climate Plan

5.1.1. National targets (CO2 reduction targets and energy poverty)

In 2017, Sweden adopted a climate policy framework which consists of climate goals, climate legislation and a climate policy council. Sweden's long-term target is to have zero net greenhouse gas emissions by 2045 at the latest. This means that the emissions of greenhouse gases from activities in Sweden shall be at least 85 per cent lower in 2045 compared to 1990. The remaining reductions down to zero can be achieved through supplementary measures. Such measures can also contribute to negative net emissions after 2045.

The supplementary measures include a) strengthening the absorption of carbon dioxide in forests and land, for example by planting trees on disused agricultural land or restoring old peatlands that had previously been dug out; b) capture and store carbon dioxide that occurs when biofuels are burned and; c) contribute to reduced emissions in other countries.

Three milestone targets are set to reach the long-term goal. Greenhouse gas emissions covered by the EU emissions trading system are not included in the milestone targets.

- By 2030 emissions are to be 63 percent lower than 1990
- By 2040 emissions are to be 75 percent lower than 1990

The emissions from domestic transport, with the exception of domestic flights, are to be reduced by at least 70 per cent by 2030, compared to 2010.

Energy poverty has not been an issue discussed in Sweden due to several favorable circumstances. However, the high and fluctuating energy prices of recent years have made the issue increasingly relevant. However, there are no targets linked to energy poverty in Sweden.

More information about Sweden's climate goals and climate work on the Swedish Environmental Protection Agency website[7].

5.1.2. Local targets (CO2 reduction targets and energy poverty)

In June 2023, the municipal council in Karlstad decided on a strategic plan and budget for the period 2024–2026. The decision included a tightening of the municipality's climate goals. The climate goals in 2017 – 2023 was "Karlstad should be a fossil-free and climate-smart municipality". The new climate goals from the year 2024 is: "Karlstad Municipality's operations must be fossil-free in 2026 and the geographical area of Karlstad must be climate neutral in 2030."

The new goal formulation is accompanied by a descriptive text, where it is clear that the ambitions in the environment and climate area need to be raised, and environmental sustainability must be a guiding

[7] https://www.naturvardsverket.se/en/topics/climate-transition/sveriges-klimatarbete/swedens-climate-act-and-climate-policy-framework/

principle in all work within the municipality. It is also emphasized that everyone in society needs to be involved in the climate transition and that it must be fair. Switching from fossil fuels, changing travel habits and consumption patterns are highlighted as three important areas to work on.

In May 2023, the municipal council decided on an Energy and Climate Plan for Karlstad municipality. The plan is accompanied by an action plan, with a large number of measures that have been distributed to administrations and companies owned by the municipality for implementation. The energy and climate plan is an important tool for the possibility of achieving the municipality's climate goals.

The municipality of Karlstad has no goals for energy poverty, but work is underway to include a fair transition in the work to reach the set climate goals.

5.2. Case study

The implementation of the case study in Sweden was elaborated to fit the conditions in Sweden. A short background is that the concept of energy poverty has been almost unknown before the last years energy crisis that followed by Russia's invasion of Ukraine. Sweden has a history of fairly low prices for energy, relatively well insulated houses, and a strong social safety system via public funds. In addition, the majority of all apartments have a rent that includes heating. All in all, it has led to circumstances where few people ended up in a position where they risked being exposed to energy poverty. Another circumstance that the implementation has taken into account is the fact that for many years there have been local energy and climate advisors in almost all municipalities in Sweden. This service is financed with support from the Swedish Energy Agency and gives private individuals, small businesses and associations access to free advice on how to reduce their energy use.

Since energy poverty is a relatively unknown concept in Sweden, there was a need to investigate what the situation looks like. Within the framework of the GETA project, a survey has therefore been carried out in two different areas within the municipality of Karlstad. The survey template, GETA Energy Poverty Tool, was developed within the GETA project, and Sweden was the first actor to use it. The survey was carried out in November 2023 by four students, Lova Lundqvist, Andreas Kvarnström, Eira Jansson, and Malin Kjell studying master of science in energy and environmental engineering (year 3- 5) at the University of Karlstad. The survey was carried out outside the entrance to the local supermarket in each area since all categories of people make purchases of food.

Figure 14 The four students Lova Lundqvist, Andreas Kvarnström, Eira Jansson, and Malin Kjell carried out the survey in November 2023.

In total 104 responses were collected by the students. It was not that easy to reach the goal that was set to have at least 100 participants. Some people were hesitant to participate since they thought that they lacked knowledge about energy issues. A few people did not know how to answer some of the questions. The reason behind this could be a number of reasons such as lacking interest or that they can afford “not knowing or caring”.

5.2.1. Description of the area

Karlstad municipality is located in Värmland county.The municipality is located in the middle of an axis between Sweden's capital Stockholm and Norway's capital Oslo. The central location is the county's residence town of Karlstad.

Approximately 62,000 of the municipality's 97,000 inhabitants live in the city of Karlstad. The population density within the municipality's geographical area is on average 83.26 inhabitants/km², but the variations are large.

The nature in the municipality is very varied. On the coast towards Lake Vänern, the landscape consists largely of open farmland and transitions in Lake Vänern into an archipelago landscape. Towards the north, the landscape turns into a hilly terrain. In the northeast, the landscape consists of continuous forest.

Prior to the implementation of the survey, an analysis of statistics was made across various areas. This work was carried out in collaboration between LIFE and the students from Karlstad University who participated in the project. The statistics that were analyzed included both aggregated earned income for the population distributed over different sub-areas within Karlstad Municipality and statistics on the housing stock (type of housing, type of accommodation, etc.) distributed across different sub-areas.

When these data had been weighed together, two different areas were selected for carrying out the survey. One selected area was Vålberg, a community located about 15 km west of the municipality's central town, Karlstad. The area shows lower wages than the average in the municipality (-13.5%) while many families live in their own houses. The other area was Kronoparken, which is located in the most north-eastern part of the city, about 7 km from the city center of Karlstad. Here, too, the average wages are comparatively low (-42%) and relatively many people live in rented apartments.

Figure 15 Map showing the two areas in the municipality of Karlstad where the study was conducted.

5.2.2. Training of local rural youth about energy poverty assessment

Instead of reaching out to rural youth to train them in a topic that is hardly understood in Sweden, another approach has been used to meet the conditions in Sweden. The fact that Sweden already has a system with local energy advisors also influenced the choice of methodology.

The method used in Sweden has been to share the result from the survey to put focus on the relatively new phenomenon of energy poverty. The results have been presented to the established local energy and climate advisors in the region, who can include this knowledge in their daily advice. The objective is that the advisors should be able to give better advice when the increased insights into the citizens' knowledge and attitude towards energy issues are taken into account.

The findings from the survey have been presented to the local energy advisor in the Municipality of Karlstad (March 8th, 2024). Furthermore, the result has been shared to all the energy and climate advisors in the different municipalities in the region during a webinar (March 25th, 2024).

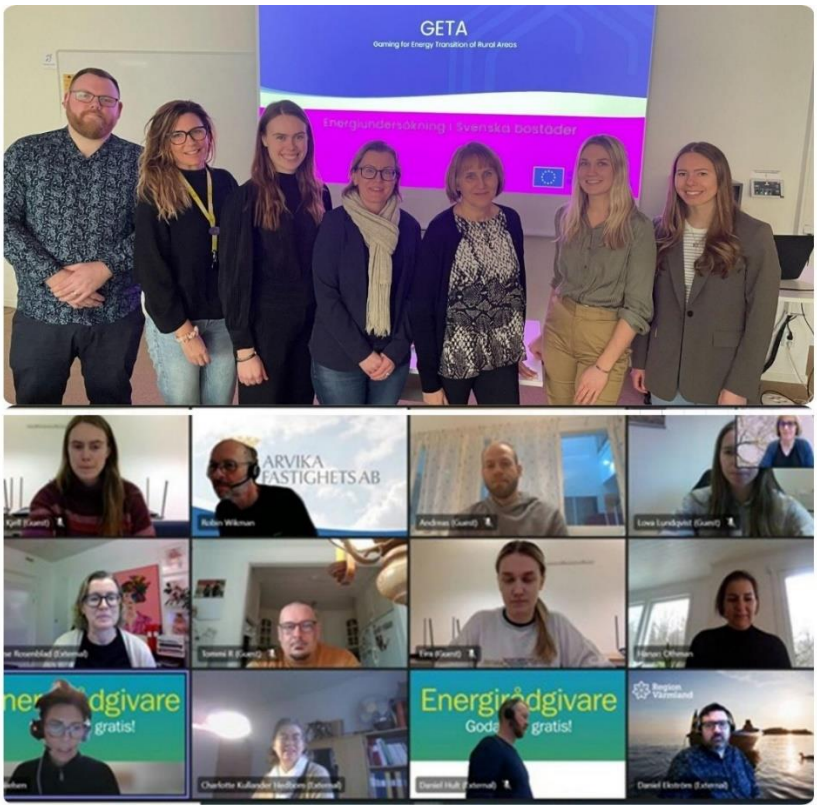


Figure 16 Meeting between the students, the Energy and Climate Advisor Rita Nielsen at the municipality of Karlstad and LIFE representatives to discuss the findings from the survey.

The result from the survey shared to all the energy and climate advisors in the different municipalities in the region during a webinar (March 25th, 2024)

5.2.3. Results and findings of the site visit

After the collection of 104 responses an analysis was carried out. The survey is presented in its entirety in Annex III. The survey was carried out outside the local supermarket in the two areas where the students asked the visitors if they wanted to participate in a survey about energy in Swedish homes. In many cases, the questions in the survey were answered with guidance from the students. It gave room for conversations that in themselves showed how the people viewed energy issues. Some reflections from the implementation have been compiled at the end of this section.

Before the results of the survey are presented, it is appropriate to give a brief description of how the housing situation in Sweden looks like, as it differs from many other EU countries. One important aspect is that almost all Swedish apartments have a rent where the heating cost (hot water and space heating)

is included as a fixed part of the rent. Since heating is a service provided by the landlord, it is not possible for the tenant to save money by lowering the temperature, which influences the risk of energy poverty. At the end of December 2023 there were 5,212,028 dwellings in Sweden. Among these 41% were in one- or two-dwelling buildings and 52% in multi-dwelling buildings; the remaining 7% was in special housing and other buildings. It is worth noting that 41 percent of the dwellings in multi-dwelling buildings are owned by housing cooperatives, 26 percent are owned by municipal housing companies and 24 percent are owned by Swedish joint-stock companies. The remaining 9 percent are owned by private persons and other owners. The average size of a dwelling in multi-dwelling buildings is 67 square meters, while in one- or two-dwelling buildings, the average size is 122 square meters. The average useful floor space per person in Sweden was 42 square meters at the end of 2023. Sweden also has an unusually high proportion of households with only one person, just over 36% of all households consist of one person. The average size of a household in Sweden is 2.2 people. The source of all statistics in this section is Statistics Sweden.

Figure 17 Photo on the top is an example of a single-family house built in the 1970s and the photo below shows a building type with tenants that was built on a large scale during 1960s and 1970s.

After the background description of the housing situation in Sweden, the results of the conducted survey can be presented. The survey showed that many people were unsure about the subject and one reflection was that ignorance and arrogance can be a consequence of being wealthy enough to afford not to take

an interest in energy issues. On the other hand, the survey shows that a relatively large group of people consider it problematic to pay energy bills on time. Of those who responded to the survey, 20.2% stated that they sometimes have difficulty paying the energy bill on time and 6.7% answered “always” to the question. It can be interpreted as a sign that energy poverty also occurs in Sweden.

Of the people who answered that they have paid their energy bills after the last payment date "sometimes" or "always", the majority are aged 20-40. One can imagine that many at that age have not had time to build up a buffer for unexpected expenses, for example increased electricity costs. Another reason could be that they may have high mortgages due to home purchases and that they, in line with the rising interest rates, have found themselves in a more difficult financial situation.

In general, the answers showed that 50% of the respondents used less than 10% of their income to pay energy bills, which is also reflected in the fact that 53.8% consider that energy costs are reasonable in Sweden.

A compilation of the questions where you could state how satisfied or dissatisfied you were with a number of parameters in your home shows the following:

- 22.1% answered that they were dissatisfied with the quality of doors and windows
- 20.2% were dissatisfied with the temperature in winter
- 18.2% were dissatisfied with the energy efficiency of their home
- 7.6% dissatisfied with the temperature in summer
- 6.8% were dissatisfied with energy efficiency regarding roofs and walls
- 5.76% were dissatisfied with the energy efficiency of their household appliances.

This shows that if there is something that should be prioritized in order to make people more satisfied with their homes and at the same time contribute to better energy efficiency, it is investing in better building technology with a focus on doors and windows. Of the people who stated that they were dissatisfied, most of them lived in housing that was at least 36 years old and usually up to 60 years and older.

Respondents who were dissatisfied with various aspects of housing lived in apartments to a greater extent than in their own houses. This may indicate that people in apartments find it easier to complain about something they have no control over (such as 29.8% with rental apartments) than homeowners who have more control over the issue.

Among the people who lived alone in the household, over half of them were dissatisfied with something in the home. One explanation for the fact that single people are more dissatisfied could be that high rents limit the possibilities of changing to a better home.

When asked about other problems that may occur in the houses, such as rot, dampness, leaking roofs, 92.3% answered that they had no problems with any of the above. However, the answer can be somewhat misleading as the problems can exist without people's knowledge.

Some reflections from the implementation of the survey:

- It seemed that some people did not understand the meaning of energy efficiency in the home or household appliances.
- Many answered with the spontaneous reaction "No, I don't know anything about that" as if they were being subjected to a test. This was more common for women, who often answered something like "My husband knows about it".
- The few people who mentioned that they received compensation (a grant paid by the state to mitigate the effects of the high energy prices during the winter of 2022/2023) were people who gave the impression that they were well off (which of course does not apply to everyone), while others who lived in apartments without being able to influence the choice of energy source did not know what could be done better.
- Several people had wanted to state that they used several forms of energy sources at the same time, which may have affected the results regarding people's "main" energy source in their homes. Several people complained that "rock heat pump" was not included, and we have no idea if they answered heat pump or something else instead.
- The result in the housing situation can be misleading as several people with apartments have reported to live in their own home with/without a mortgage.
- It was difficult to see any relationship between the answers to the different questions and to the level of education
- Very equal distribution in % for women and men on spread in responses to the scale, not at all satisfied-very satisfied both in winter and summer.
- Higher proportion of not satisfied (negative side) responses for winter than summer for both men and women.
- More men indicate answers that are more negative in the summer than women.

VI. Bosnia and Herzegovina

6.1. National Energy and Climate Plan

After experiencing some delays and interruptions over the last years, Bosnia and Herzegovina (BiH) finally moved towards the preparation and adoption of NECP. The draft integrated National Energy and Climate Plan of Bosnia and Herzegovina covering the period 2025-2030 was submitted by the authorities of Bosnia

and Herzegovina to the Energy Community Secretariat in June 2023. At the end of 2023, the Secretariat made a comprehensive assessment of the draft NECP of Bosnia and Herzegovina. In the Secretariat's view, the draft plan of Bosnia and Herzegovina in its current form, lacks the analytical basis, the assessment of the impacts of the planned policies and the investments needed to achieve the corresponding targets and objectives. It does not fulfill its objective, namely, to provide a clear set of policies and measures ("PaMs") that will set Bosnia and Herzegovina on a predictable path to achieve its 2030 energy and climate targets. The final version of NECP must be submitted by BiH authorities to the EnC Secretariat by 30 June 2024.

Figure 18 Map of the country

6.1.1. National targets (CO2 reduction targets and energy poverty)[8]

As outlined in the drafted National Climate and Energy Plan (NCEP) of Bosnia and Herzegovina, the country has committed to reducing its greenhouse gas (GHG) emissions by 41.2% (15.65 MtCO2) compared to 1990 levels. However, the awaited adoption of the National Energy and Climate Plan (NECP) is pending. In the interim, pivotal strategic documents for the energy sector include the Framework Energy Strategy of Bosnia and Herzegovina 2035 and the enhanced Nationally Determined Contribution (NDC). The NDC aims to achieve a GHG emissions reduction of 33.2% to 36.8% by 2030 and 61.7% to 65.6% by 2050, relative to 1990 levels. After the 1990s, emissions trends indicate a peak in 2011 at 28,107 GgCO2eq, representing approximately 83% of 1990 emissions. This increase was primarily attributed to escalated coal-fired power generation. Subsequently, emissions experienced a significant decrease in 2012 due to a

[8] Governance and NECPs - Energy Community Homepage (energy-community.org)
NDC BiH_November 2020 FINAL DRAFT 05 Nov ENG LR.pdf (unfccc.int)

reduced contribution from thermal power plants. By 2014, emissions totaled 26,062 GgCO2eq, marking a reduction of about 23.5% compared to 1990 levels. Per capita emissions in 2014 amounted to approximately 7.38 tons of CO2eq, indicating a 15% decrease compared to the EU average.

When evaluating emissions relative to gross domestic product (GDP), Bosnia and Herzegovina's emissions are nearly five times higher than the EU average, with 1.87 kg CO2eq per euro in 2014 compared to the EU's 0.39 kg CO2eq per euro. These statistics reflect Bosnia and Herzegovina's economic and social circumstances, characterized by poverty, relatively low GHG emissions, and an even lower per capita GDP, indicative of inefficient resource utilization, particularly in energy.

The enhanced NDC proposes the integration of new renewable energy sources such as wind, solar, biomass, and hydroelectric power by 2030. However, both strategic documents maintain and potentially expand reliance on coal for electricity generation, with plans for the introduction of 1,050 MW of new coal-fired thermal power plants. To align with the objectives of the Sofia Declaration and achieve carbon neutrality by 2050, Bosnia and Herzegovina needs a comprehensive strategy for the gradual phase-out of coal. Once the NECP of Bosnia and Herzegovina is officially adopted, adjustments to the NDC will be imperative to ensure alignment with the targets outlined in the NECP.

The acknowledgment of conditions like energy poverty and vulnerability is evident across various strategic documents in Bosnia and Herzegovina, including the drafted NECP, the BiH Framework Energy Strategy Until 2035, the new Federation of BiH Development Strategy 2021-2027, and the Republic of Srpska Energy Sector Development Strategy Until 2035. These documents emphasize the pivotal role of enhancing energy efficiency in addressing energy poverty, particularly concerning electricity consumption and household heating. The Federation of BiH Law on Energy Efficiency (Official Gazette no. 22, March 24, 2017) lacks explicit mention of these terms. Despite this recognition, crucial legislation and accompanying regulations necessary for significant progress and a more targeted approach remain absent.

6.1.2. Local targets (CO2 reduction targets and energy poverty)

Figure 19 Territorial view of the municipality of Hadzici near Sarajevo, Bosnia and Herzegovina

The Development Strategy 2020-2030 and LEAP 2020 for the Municipality of Hadzici identify industrial, residential, and transportation sectors as the primary sources of emissions, especially solid fuel combustion and traffic emerge as significant sources of emissions. Given the prevalence of small-scale solid fuel combustion and the limitations of systemic intervention, there is a pressing need to develop strategic initiatives aimed at long-term reduction of coal combustion, while efforts should be directed towards incentivizing the adoption of cleaner energy sources such as gas, electricity, and renewables. A review of the Municipality's budget reveals a lack of allocation towards addressing these challenges. Despite the recognition of emission sources and energy consumption patterns, there is scant evidence of targeted interventions in the forthcoming period. To conclude, the Municipality of Hadzici faces significant challenges related to CO2 reduction and energy poverty, exacerbated by the lack of official data and strategic initiatives. Urgent action is required to address the predominant sources of emissions, promote energy efficiency, and transition towards cleaner energy sources.

6.2. Case study

In connection with the preceding sections, it is evident that energy poverty poses a complex social challenge in Bosnia and Herzegovina, persisting even before and escalating gradually during the energy transition process. Addressing this requires defining energy poverty, identifying affected households, and implementing assistance programs. The reliance on fossil fuels for electricity, coupled with the transition to market pricing and coal exit, will notably impact energy prices, particularly affecting vulnerable consumers. The shift to renewable energy and natural gas, driven by CO2 pricing and rising gas prices, further complicates the situation for energy-poor populations. Overcoming challenges in improving

energy efficiency, such as funding, education, and documentation hurdles, is also essential. A fair energy transition requires support and clearly defined energy poverty mitigation policies.

6.2.1. Description of the area

Considering all challenges in Bosnia and Herzegovina regarding energy transition and energy poverty, our goal was to identify "a model" for research, an area which faces similar challenges as most settlements and municipalities of this size in Bosnia and Herzegovina. Through the research we would obtain results which are characteristic for areas of similar characteristics. The survey within the project was focused on the Municipality of Hadzici, one of nine municipalities in the Canton of Sarajevo. The total area of the municipality of Hadžići is 273.26 km². The area is geographically divided into three regions with 89 villages and settlements. According to the 2013 census, the municipality of Hadžići has 24,979 inhabitants, 7,569 households, and 11,674 apartments. The average population density is 91 inhabitants per km².

Figure 20 Aerial view of the municipality of Hadzici near Sarajevo, Bosnia and Herzegovina

The share of individual housing units in the total number of households, considering the existing infrastructure, is very high. This actually corresponds to the official assessment of the residential sector in Bosnia and Herzegovina, according to which 66.47% of total residential units are those of individual housing type, while 33.53% are collective housing.

All settlements within the Municipality are supplied with electricity, except for parts of the settlement where illegal construction is evident, and investors do not have the necessary documentation for construction. As it is in the majority of Bosnia and Herzegovina, large parts of the population in Municipality of Hadzici consumes electricity generated in thermal power plants using fossil fuels. Households of individual housing mostly solve their heating problem by using wood, firewood and coal in inappropriately constructed fireplaces. Collective housing facilities in the central part of the municipality are covered by central gas heating (8000 inhabitants).

6.2.2. Training of local rural youth about energy poverty assessment

Prior to the energy poverty assessment, it was necessary to train the youth about energy transition and energy poverty issues. REIC announced a call for youth participation in "Energy Transition and Energy Poverty", which resulted in 13 applications. On March 12th, 2024, REIC hosted an online meeting for all applicants. The objective of the session was to engage with potential participants, provide an overview of the GETA project, outline the methodology and forthcoming activities, and assess the baseline knowledge of youth on these subjects for tailoring the training materials. Following the meeting, 10 participants were chosen from among students and high school students in the designated area.

Figure 21 Training in Sarajevo, Bosnia and Herzegovina

The training sessions took place from March 27th to March 29th, 2024. The training sessions covered a broad spectrum of topics related to energy transition and combating energy poverty. It began with an introduction to the GETA project, followed by insights into Bosnia and Herzegovina's energy system and discussions on the challenges and opportunities in energy transition. Participants explored the concept of energy poverty, its global perspective, and strategies for overcoming it. Workshops focused on designing local initiatives and policies, funding mechanisms, and understanding the intersection of technical, political, and socio-economic aspects of energy poverty. Throughout the sessions, there was active engagement through presentations, discussions, and interactive activities aimed at fostering understanding and collaboration among participants.

After completing the training sessions and familiarizing themselves with the GETA tool, participants carried out surveys among households in selected areas within the Municipality of Hadzici. A total of 101 households were visited, all of them responded, providing significant insights into energy-related issues

and requirements within the community. The activity was supported by the Municipality, which informed inhabitants through the social media channels about the ongoing survey.

The subsequent subsection presents the findings from these surveys, offering a comprehensive analysis of the collected data and its implications for future project initiatives

6.2.3. Results and findings of the site visit

To comprehend the findings of the survey, it's essential to outline some general facts about the country. The Bosnia and Herzegovina Agency for Statistics conducted the Household Budget Survey 2021/2022, covering around 8600 households, evenly split between urban and non-urban areas. According to the survey data, the average household size in Bosnia and Herzegovina is 2.8 members, with urban areas averaging 2.6 members and non-urban areas averaging 2.9. The findings from our survey reveal a different household structure in the Municipality of Hadzici. While it's impossible to precisely calculate the average household size, it's clear that the average exceeds 3.6 members. The majority of households consist of four members, accounting for 41.6% of the total. In conclusion, the report reveals inconsistency and unexpected outcomes, suggesting a widespread unfamiliarity with the concept of energy poverty among residents. These findings underscore the pressing need for comprehensive awareness-raising initiatives to educate citizens about the significance of energy efficiency and its impact on household finances. Addressing these disparities and enhancing community understanding are crucial steps in effectively combating energy poverty in the Municipality of Hadžići.

Regarding housing ownership, the latest available data from the official BiH statistic (2015) shows that 92.9% of housing units are owned or co-owned, with only 2.7% of inhabitants being tenants and 4.4% residing in dwellings for free use. If we analyze the results from a survey conducted in the Municipality of Hadzici, we can only confirm the above-mentioned structure. Out of 101 inhabitants, 96% of inhabitants are owners of their housing units: 76.2% own a home without mortgage, 19.8% own a home with mortgage, while only 4% live as a tenant.

Several factors influence this structure, including the opportunity for pre-war occupants of state-owned apartments to purchase them after the war under highly favorable conditions. Additionally, tenants are primarily found in major cities rather than in semi-urban and rural areas. Furthermore, due to housing unaffordability, young people often continue living with their parents for extended periods or different generations of the same family still live in the same household. The size of the households that we find in Hadzici additionally supports these facts.

The majority (74,2%) live in an individual housing unit, while 25.8% live in an apartment. Out of all respondents, 20.8% live in relatively new buildings, built in the past 25 years, 33.7% live in buildings 25-35 years old, 35.6% live in buildings 35-50 years old, and 9.9% live in buildings which are older than 50.

According to the official typology of residential buildings in Bosnia and Herzegovina, a significant portion of buildings in Bosnia and Herzegovina lack completed facades (25.9%), with 26.9% having facades built

afterwards. Residential buildings constructed between 1971 and 1980, particularly single-family houses, exhibit the highest heat energy demand for heating (37.74%).

It was a big surprise to see that most inhabitants confirmed they are satisfied or very satisfied with the level of comfort in the home during the summer and the wintertime. Only 4% are (very) unsatisfied with comfort during summer, and 5% during the winter, and an equal number of men and women responded. The wintertime in Hadzici is a bigger challenge than summer, so we will focus on it. Those who reported to be unsatisfied during the winter also declared as unsatisfied with that general energy efficiency of the home, as well as of the home devices, and of separate elements of the building. They find the energy costs unaffordable, for 80% of them spend more than 30% of household incomes to cover it, and 20% spend 10-30% of total income. Still, only 20% of this group of households are always late with paying the bills and 2% are sometimes late.

A general overview of the results regarding the questions where residents could express the level of their satisfaction or dissatisfaction shows the main results:

- **18.8% are (very) unsatisfied** with the quality (energy efficiency) of a roof and walls,
- **10.9% express dissatisfaction** regarding the quality (energy efficiency) of windows and doors,
- **9.9% of unsatisfied** regarding the EE of the building and
- **6.9% of respondents** are unsatisfied with EE of home devices.

Quite a large ratio of respondents shares their neutrality, from 18.8% regarding the quality of a roof and walls to 31.7% regarding the energy efficiency of the building.

It is interesting that 18.8% (19 persons) of all 101 respondents declared as (very) unsatisfied with the quality (energy efficiency) of a roof and walls, while in the later question 21.8% reported damp walls (22 persons) and 5% (5 persons) reported a leaking roof. Out of these 27 respondents, only 9 (33.3%) declared as unsatisfied with the quality of the roof and walls, and only 2 respondents (7%) declared as unsatisfied with the energy efficiency of the building. So, in total 66% are not aware of the connection between energy efficiency and the issue they experience.

Based on this detailed comparison of the results, we can draw some conclusions and assumptions:

- The population in general is traditionally aware of the importance of healthy construction elements of the building, including wall, floor, foundations, roof, doors, and windows, but they are not aware of its connection with energy efficiency.
- The importance of energy efficiency of home and home devices is not as much present. The large ratio of neutral answers (up to 31.7%) could mean that respondents do not know anything about it in their home or they are not aware of it. According to the unexpectedly small percentage of those who are unsatisfied, we could assume it is not their priority.

To conclude, this provides us with significant opportunities to enhance the community's awareness of energy efficiency, as one of the main areas that requires improvement in order to overcome issues related to energy poverty.

According to the official data from the Household Budget Survey 2021/2022, the average monthly household expenditure on total consumption was 908.05 EUR, with housing and energy accounting for a significant portion (24.1%, 217.90 EUR). During the same period, the average monthly net income per person was 575.80 EUR. Further on, the Agency's data indicates that 16.5% of households are classified as generally poor, while 8.4% are on the verge of poverty.

When we start to analyze the energy costs in household, another shocking fact appeared:

- only **12.9% households pay less than 10%** of its total income for energy consumption,
- 53.5% of households pay 10-30% of total household income,
- 23.8% of households pay more than 30% of total household income for energy consumption.

Contrary:

- 47.5% of households finds the costs are affordable,
- 33.7% of households finds it neutral,

- only **18.8% find it unaffordable**.

When we consider the disproportionality between the average monthly income in BiH and the monthly expenses for energy needs, we cannot ignore such results. We must ask how it is even possible that respondents are unaware of the magnitude of the costs? Still most households in the Municipality of Hadzici consistently pay their bills on time (84.2%), while only 13.5% are sometimes late and 2% are always late. The findings would be more understandable if we were addressing households facing potential energy supply disruptions due to late payments. However, the survey reveals that even those not in such circumstances, such as those utilizing biomass or wood for heating, consistently fulfill their financial obligations. Nonetheless, such high expenses must significantly impact the financial stability of the family, especially during the winter time.

In conclusion, the report reveals inconsistency and unexpected outcomes, suggesting a widespread unfamiliarity with the concept of energy poverty among residents. These findings underscore the pressing need for comprehensive awareness-raising initiatives to educate citizens about the significance of energy efficiency and its impact on household finances. Addressing these disparities and enhancing community understanding are crucial steps in effectively combating energy poverty in the Municipality of Hadžići.

Figure 22 Building types identified by the survey in Hadzici

VII. Analysis and Result

The energy poverty assessment was conducted in four countries as part of the GETA projects: Italy, Sweden as EU- countries and Albania and Bosnia Hercegovina as non-EU countries. The four countries based their assessment in the same methodology by using the list of indicators from EU observatory HUB for the energy poverty. The list of indicators was then operationalized into 20 questions and were

digitalized into the GETA webapp. In total 545 surveys were conducted, ranging from 100 in Italy to 215 in Albania.

The age of the respondents was almost similar to all partner countries, in the range between 21 and 40 years old. Regarding the status of ownership, majority of respondents in Albania, Italy and BiH, they own their property (more than 70%) and in Sweden the only 9% of the local population have ownership to the property, the rest pay monthly rent to the housing cooperatives or private companies who deal with management of the property.

In the municipality of Kavaja (Albania) most of the respondents (78%), stated that they are living in individual houses. The survey shows a similar situation in BiH where the majority (74,2%) live in an individual housing unit. In Italy, most people (85%) stated that they are living in apartments In Sweden, were asked 56%, answered that they are living in a one-family house.

Regarding the number of rooms, in Albania the number of people living in one apartment (2 rooms) is usually four, so it is 1 room for two people. In Italy the number of people living in a f our room apartment is 4 people, so the ratio is 1 room per person. In BiH and Sweden the ratio is the same, 1 person for 1 room. Most of the respondents in Italy, answered that the age of their building lower than 25 years old so the age of the buildings are quite new. In Albania they answered was that most people are living in buildings with an age 25-30 years old, relatively new and the same information was provided from BiH.

Regarding the level of Energy Efficiency of the houses during the summer, in Albania, 39% of the responded answered neutral, in Italy, 30% of the responded answered satisfied, in BiH they answered very satisfied and in Sweden the same. The same answers were almost regarding the level of energy efficiency of their devices. In Italy, about 90% of the respondents use gas for heating and cooking, in Albania most of them use electricity of hearing and gas for cooking and in BiH most them use wood for heating and electricity and gas for cooking. In Italy, the energy cost is not an issue for the citizens since they use approximately 10% up to 30% of their income, in Albania, 25% answered that the energy bill is non affordable, in BiH they answered the energy bill is affordable and in Sweden they replied the same.

In Sweden, is to highlight that 20% of the households have difficulties paying the energy bill on time and only 6.7% are always late with the payment. Still, there is no more information about the reasons of delaying the payments. In BiH and Albania, were noticed a contradictory results, since the average income from citizens in 500-900 EUR net per month and from the other side, most of the responded said the price of electricity is still affordable. Such information misleads to poor results and it is not representative. Nevertheless, from this result we can conclude that the local population still is not fully aware about the energy efficiency measures of their house and the potential energy savings it might bring to such communities.

From the assessment conducted, is to be highlighted that the local communities in Western Balkan countries are still not fully aware about energy efficiency savings measures to combat energy poverty. Despite the fact, the quality of the buildings turned out to be considered as relatively good, there is still a gap in the building renovation perspective. In Sweden is to be highlighted that the most complains were

addressed to the lack of energy efficiency of windows and roofs, moreover the level of awareness to the citizens is relatively low. In Italy, the study showed that only the breadwinner is aware of the energy bills and the rest of the family is not fully aware about such cost. Moreover, a considerable percentage of the population, responded that they have delays in paying the energy bill but this information is not quite clear if this is related with the level of incomes or lack of commitment.

To sum up, still the level of energy efficiency in the EU countries like Italy and Sweden is higher than in Albania and Bosnia Hercegovina. This is linked to the monthly incomes, level of awareness towards energy efficiency measures, size of the houses and number of people living in one house (this applies more to Albania). The energy poverty concept needs to be more mainstreamed to social policies and the central government shall pay more attention for supporting local citizens.

Appendix

Annex 1 – List of questions in the GETA app

1. In which country do you live?
a. Albania
b. Bosnia and Herzegovina
c. Italy
d. Sweden

2. How old are you?
a. 20 or younger
b. 21-40
c. 41-60
d. 61-80
e. 81 or older

3. My sex is
a. Women
b. Man
c. Prefer not to say

4. What is the educational level of the breadwinner(s) in the family?
a. Lower than upper secondary school
b. High school
c. Gymnasium

5. How do you live?
a. In an apartment
b. In a one family house
c. Other

6. How many people are staying in your home?
a. 1

b. 2
c. 3
d. 4
e. 5
f. More than 5

7. How many rooms do you have in your home?
a. 1
b. 2-5
c. More than 5

8. What is the age of the building you live in?
a. Less than 25 years
b. 25-35 years
c. 36-60 years
d. Older than 60 years

9. What does your housing situation look like?
a. Tenancy
b. Own home with mortgage
c. Own home without mortgage

10. What is your opinion regarding the level of comfort (temperature) in your home during the summer time?
a. Very unsatisfied
b. Unsatisfied
c. Neutral
d. Satisfied
e. Very satisfied

11. What is your opinion regarding the level of comfort (temperature) in your home during the winter time?
a. Very unsatisfied
b. Unsatisfied
c. Neutral
d. Satisfied
e. Very satisfied

12. What is your opinion regarding the level of energy efficiency of your building?
a. Very unsatisfied
b. Unsatisfied
c. Neutral
d. Satisfied
e. Very satisfied

13. What is your opinion regarding the level of energy efficiency of your devices?
a. Very unsatisfied
b. Unsatisfied
c. Neutral
d. Satisfied
e. Very satisfied

14. What is your opinion regarding the quality (energy efficiency) of your windows and doors?
a. Very unsatisfied
b. Unsatisfied
c. Neutral
d. Satisfied
e. Very satisfied

15. What is your opinion regarding the quality (energy efficiency) of your roofs and walls?
a. Very unsatisfied
b. Unsatisfied
c. Neutral
d. Satisfied
e. Very satisfied

16. What is the main source of heating in your home?
a. Gas
b. Electricity
c. Wood or biofuels
d. District heating
e. Burning oil
f. Heat pump
g. Other

17. What is the main source of energy used for cooking?
a. Gas
b. Electricity
c. Wood or biofuels

18. Do you have any of the following problems with your house?
a. A leaking roof
b. Damp walls/floors/foundation
c. Rot in window frames or floor
d. None of the previous

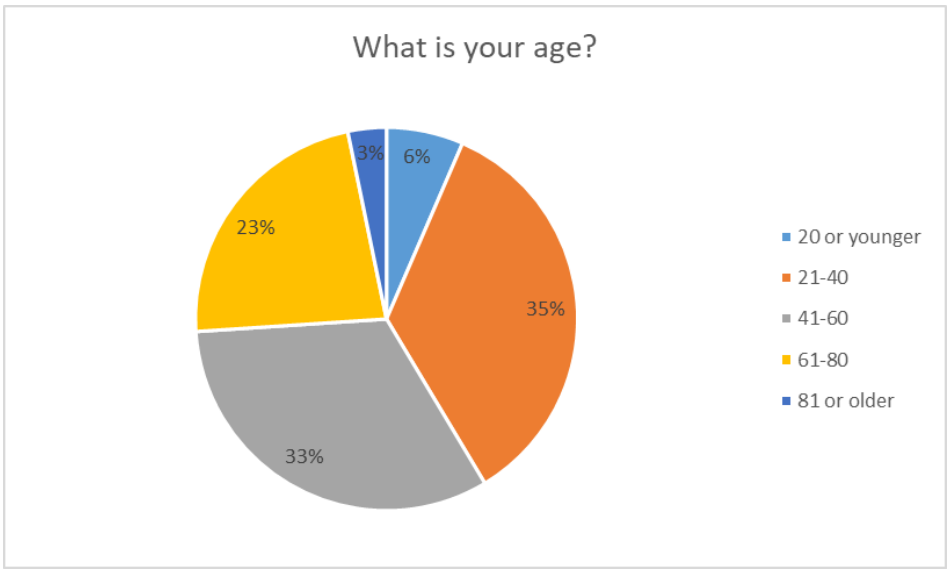
19. What is the level of energy costs for your home?
a. Unaffordable
b. Neutral
c. Affordable

20. How much of your household income is used for energy costs (electricity and heating)?
a. Less than 10%
b. 10-30%
c. More than 30%
d. I do not know

21. Have you been late paying your energy bill (electricity and heating)?
a. Never
b. Sometimes
c. Always

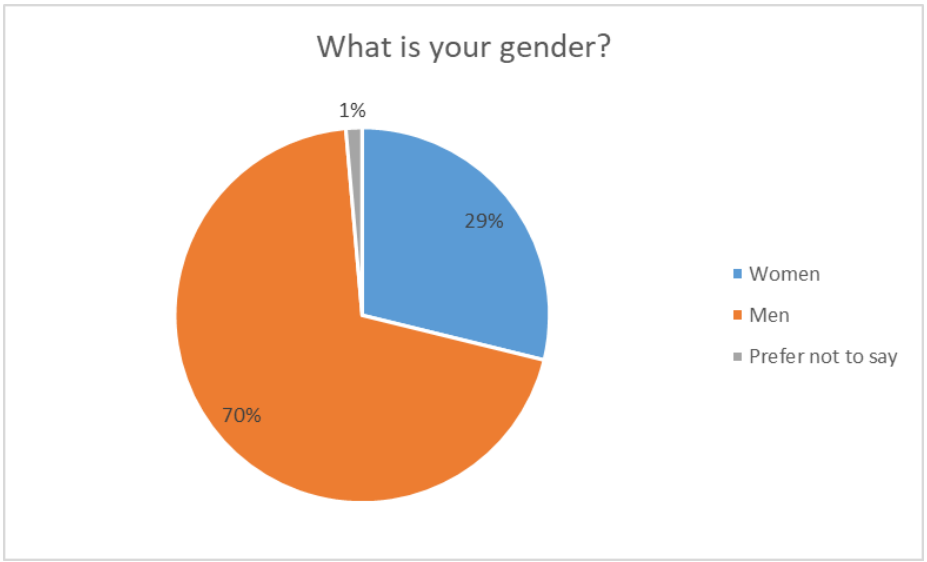
Annex II – Results for the energy poverty assessment in Albania

Q1: What is your age?



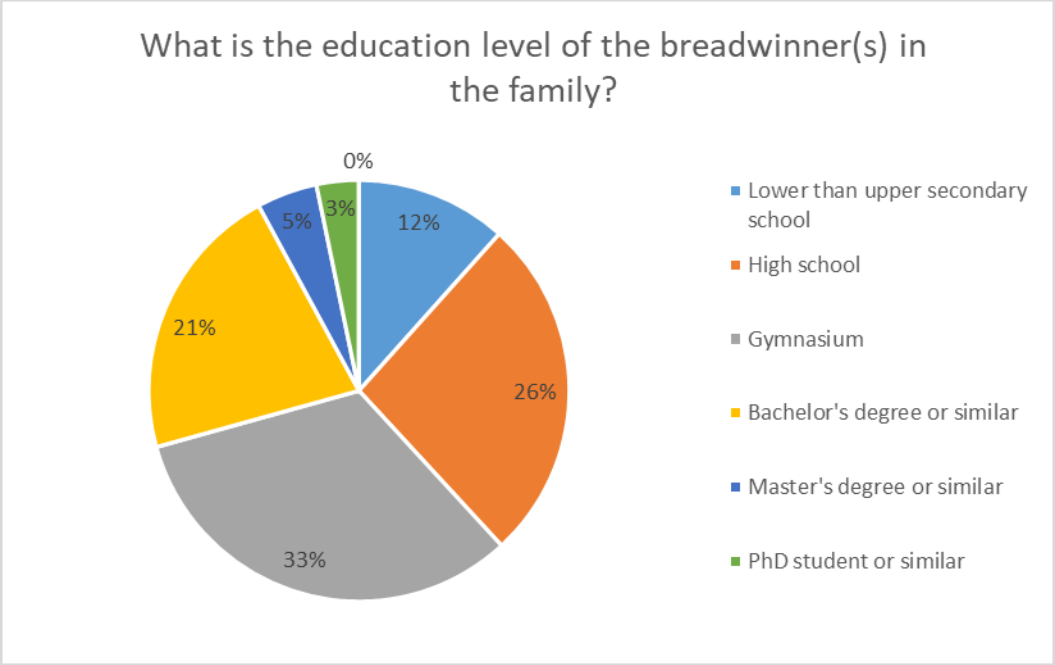
Answer: 33% of the respondents were in the range of age 41-60 years old. 23 % were in the range of 61-80 years old and only 3% of the age 20 years old or younger.

Q2: What is your gender?



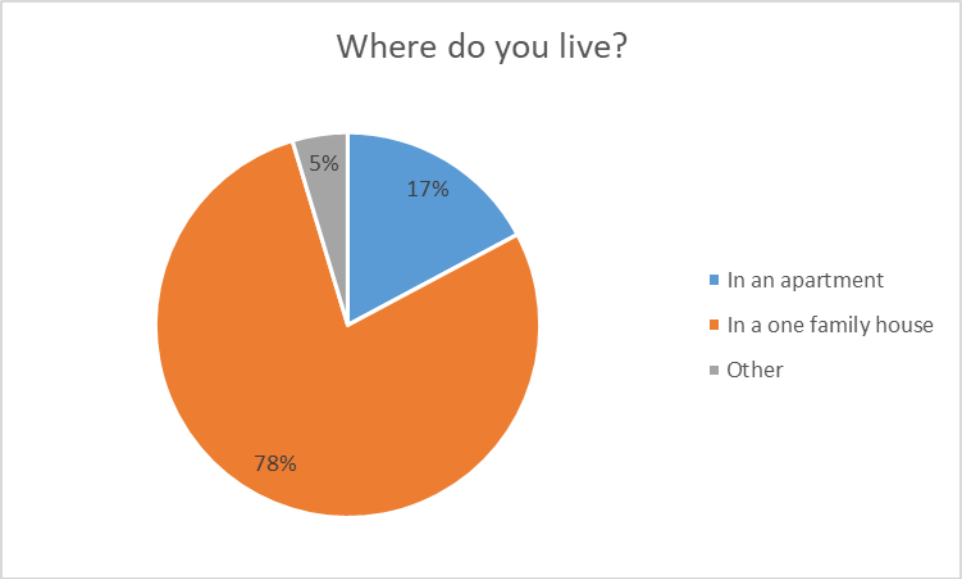
Answer: 70% o the respondents were man and 29% of the respondents were women and 1% did not prefer to share his/her age.

Q3: What is the education level of the breadwinner(s) in the family?



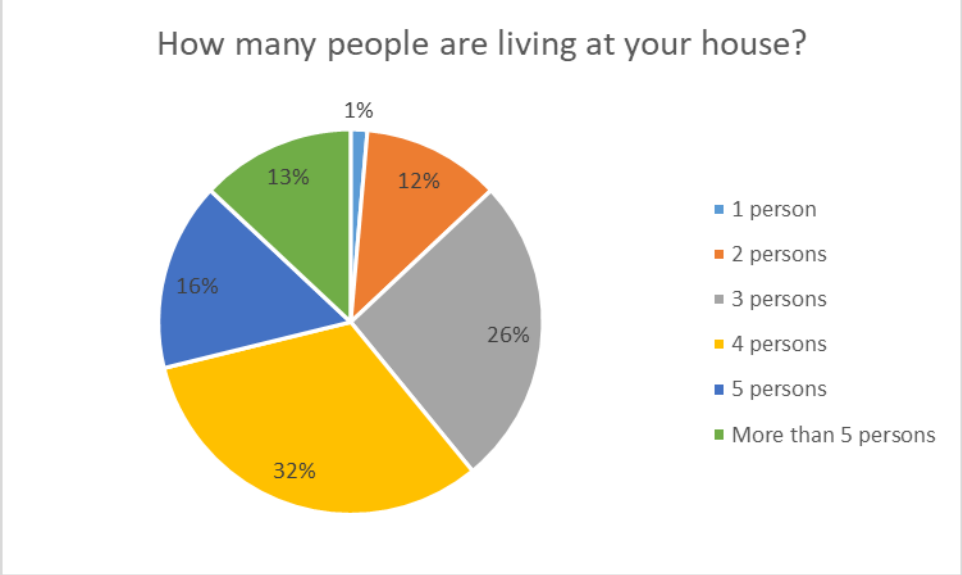
Answer: 33% of the interviewers responded, the breadwinner has a gymnasium, 26% has high school education, 21% bachelor degree education, 12 % as master degree education and only 12 % with lower than upper of secondary education.

Q4: Where do you live?



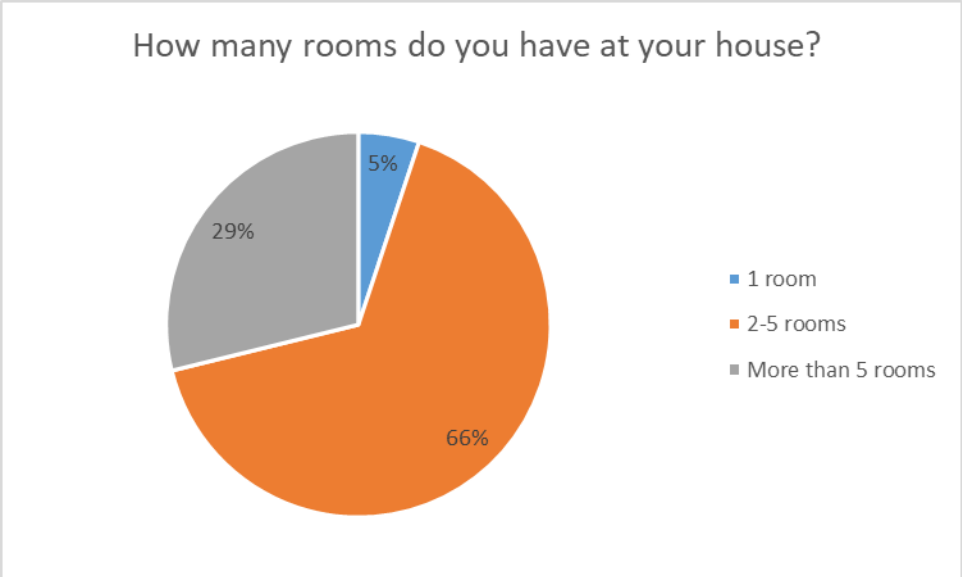
Answer: 78% of the interviewer responded they live in an individual house (dwelling), and 17% live in multi family house.

Q5: How many people are living at your house?



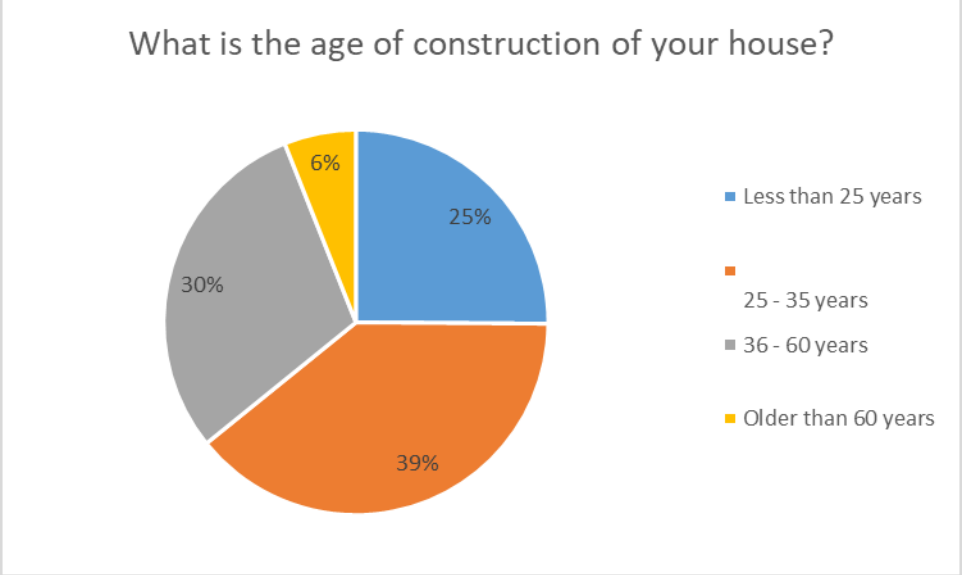
Answer: 32% of the interviewers responded they live with 4 people in their space, 26% live with 3 persons, 16% live with 5 persons, 13% with more than 5 persons and 12% with only 2 persons.

Q6: How many rooms do you have at your house?



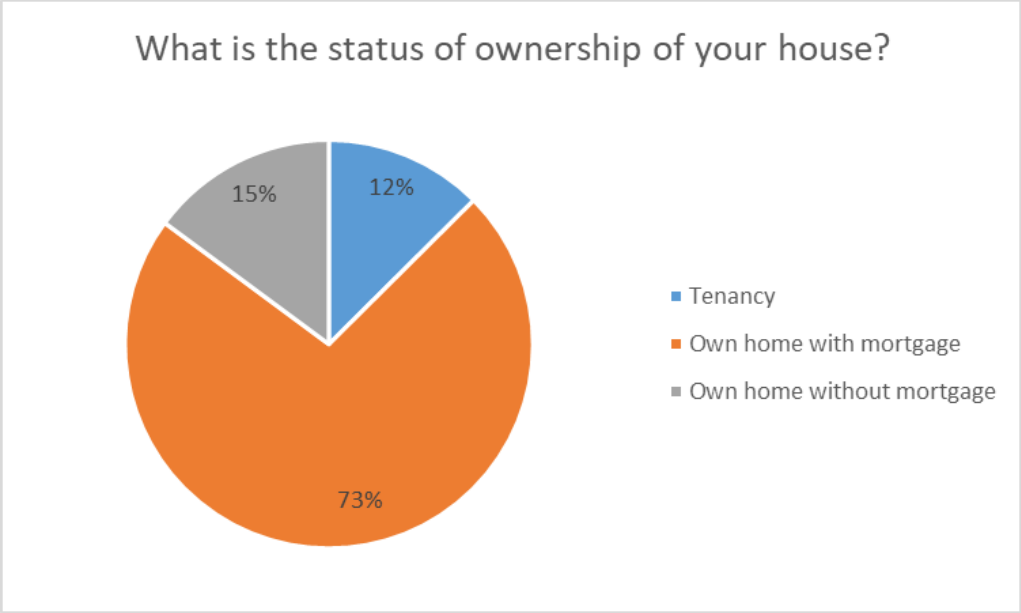
Answer: 66% of the interviewer, responded they have 2-5 rooms in their apartment, 29% responded they have more than 5 rooms and 5% have only 1 room.

Q7: What is the age of construction of your house?



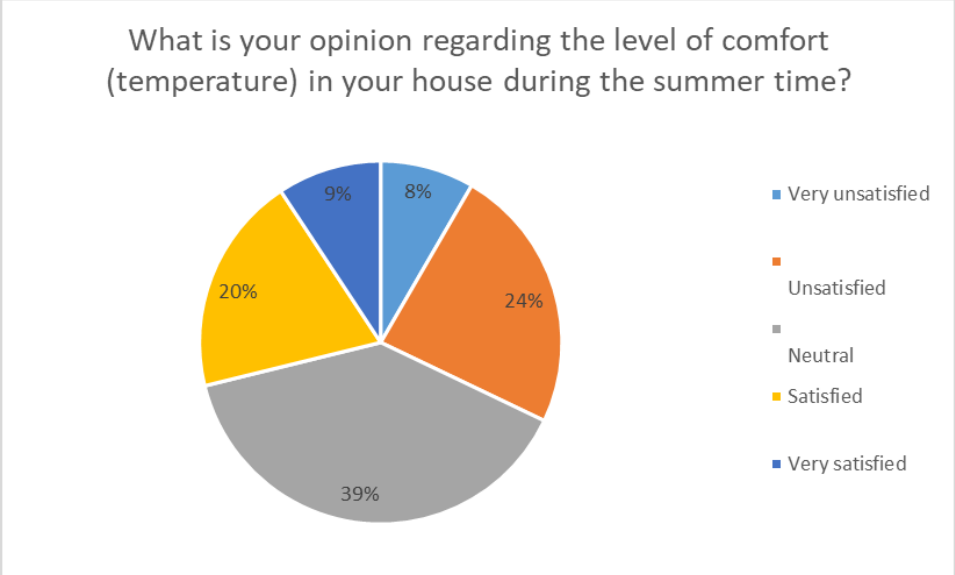
Answer: 39% of the interviewers responded, the age of their building is 25-35 years old, 30% responded is 36-60 years old, 6% responded is older than 60 years and 25% responded is less than 25 years.

Q8: What is the status of ownership of your house?



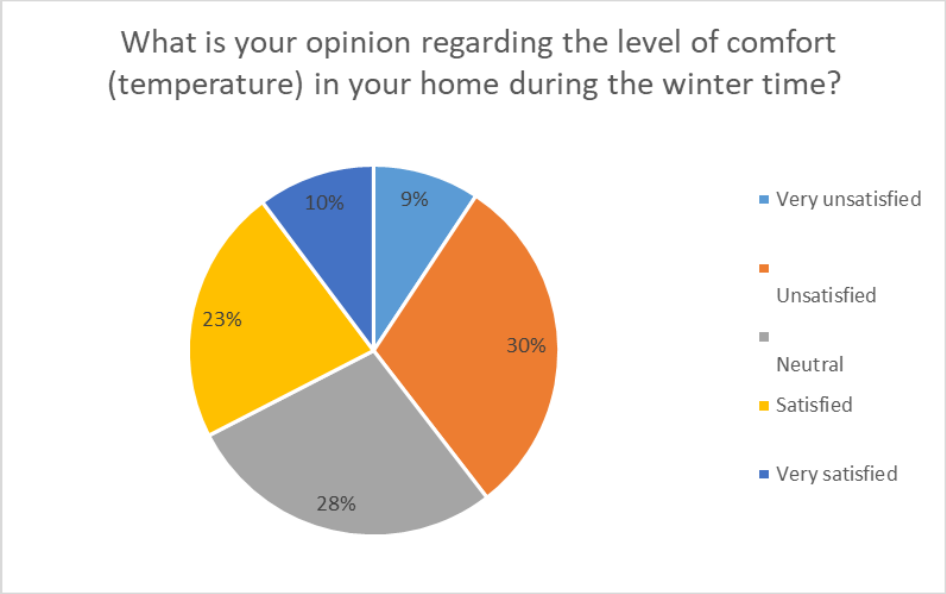
Answer: 73% of the interviewers, responded that they own their house with a mortgage, 15% responded without mortgage and only 12% with tenancy.

Q9: What is your opinion regarding the level of comfort (temperature) in your house during the summer time?



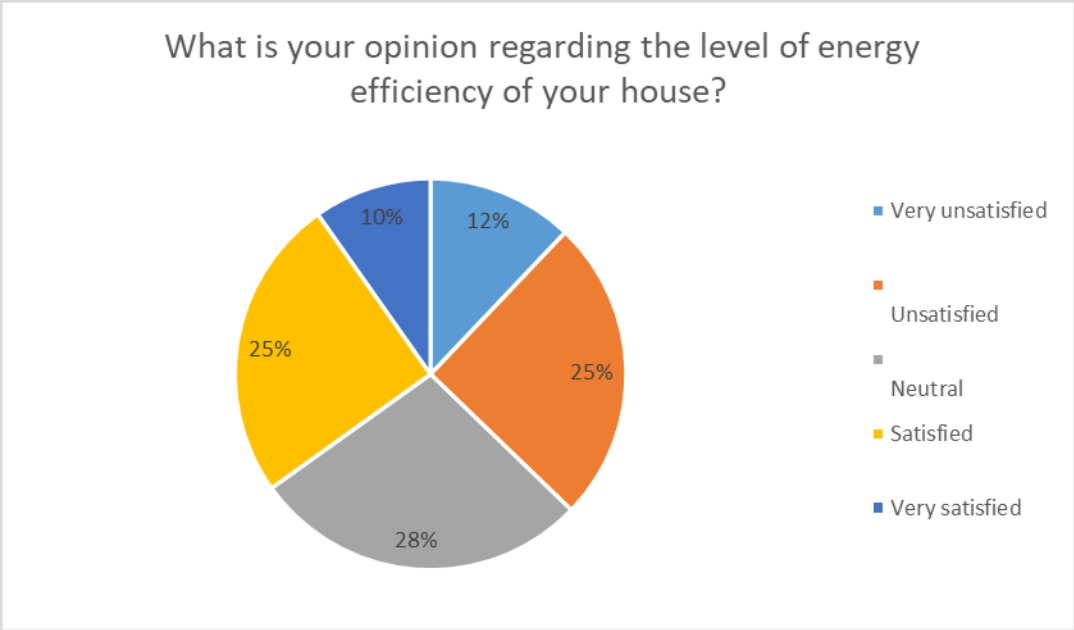
Answer: 39% of the interviewers, responded they are neutral, 24% responded they unsatisfied, 20% responded are satisfied and only 8% very unsatisfied.

Q10: What is your opinion regarding the level of comfort (temperature) in your house during the winter time?



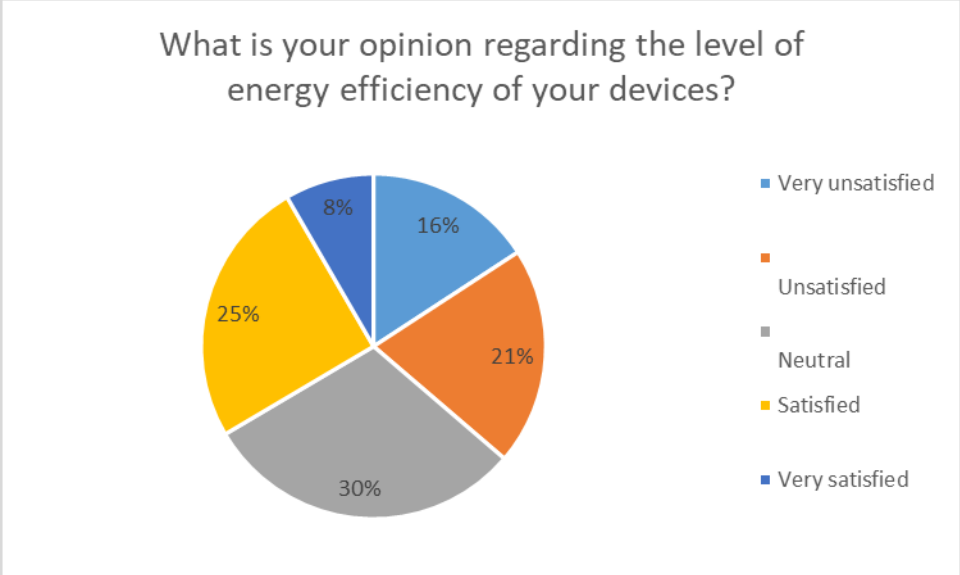
Answer: 28% of the interviewers, responded they are neutral, 23% responded they are satisfied, 30% responded are unsatisfied and only 10% very satisfied.

Q11: What is your opinion regarding the level of energy efficiency of your house?



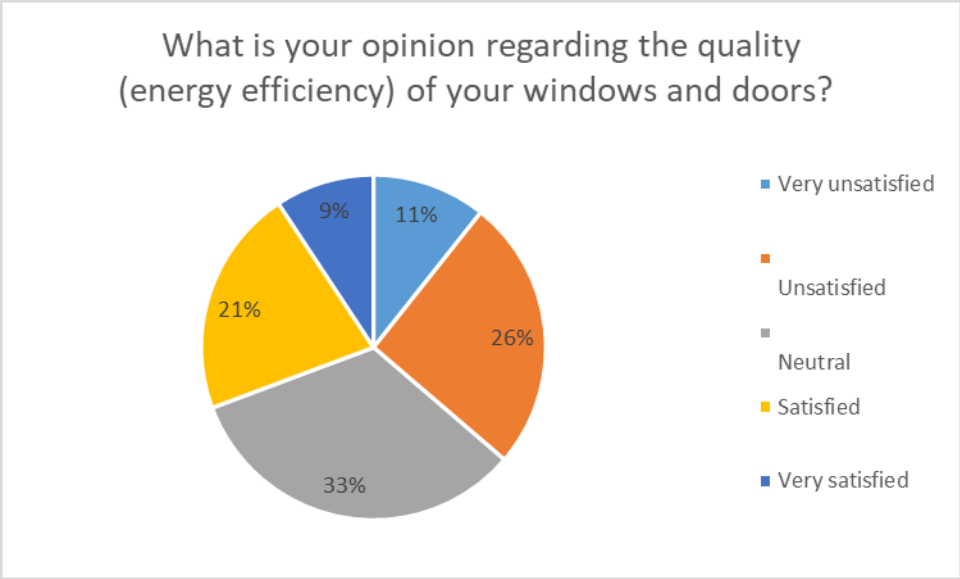
Answer: 28% of the interviewers, responded they are neutral, 25% responded they are satisfied, 25% responded are unsatisfied and only 10% very satisfied.

Q12: What is your opinion regarding the level of energy efficiency of your devices?



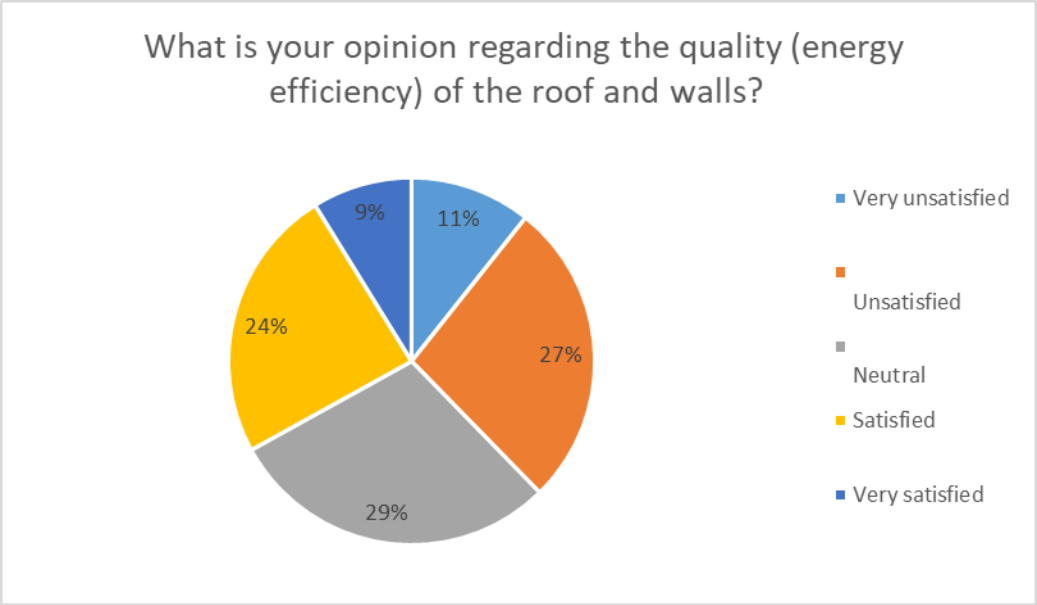
Answer: 28% of the interviewers, responded they are neutral, 25% responded they are satisfied, 25% responded are unsatisfied and only 10% very satisfied.

Q13: What is your opinion regarding the quality (energy efficiency) of your windows and doors?



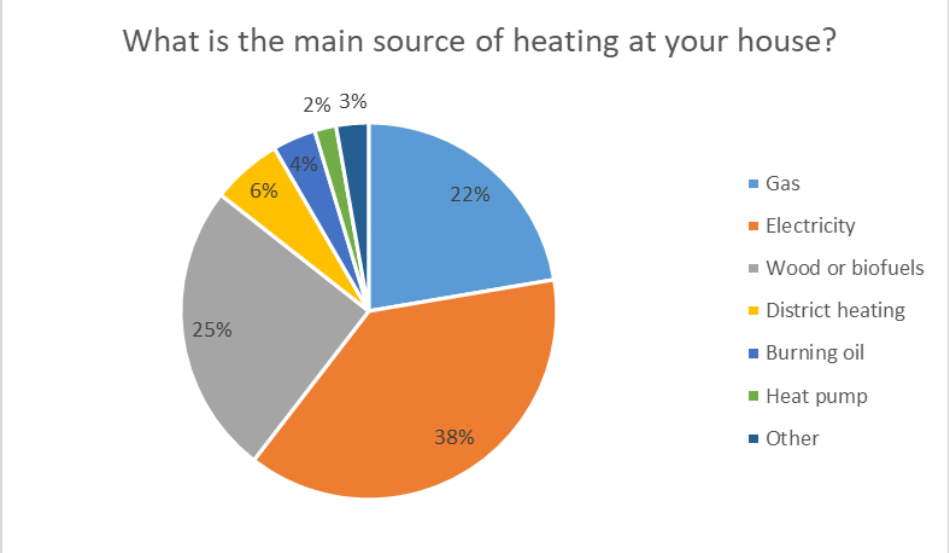
Answer: 33% of the interviewers, responded they are neutral, 21% responded they are satisfied, 26% responded are unsatisfied and only 9% very satisfied.

Q14: What is your opinion regarding the quality (energy efficiency) of your roofs and walls



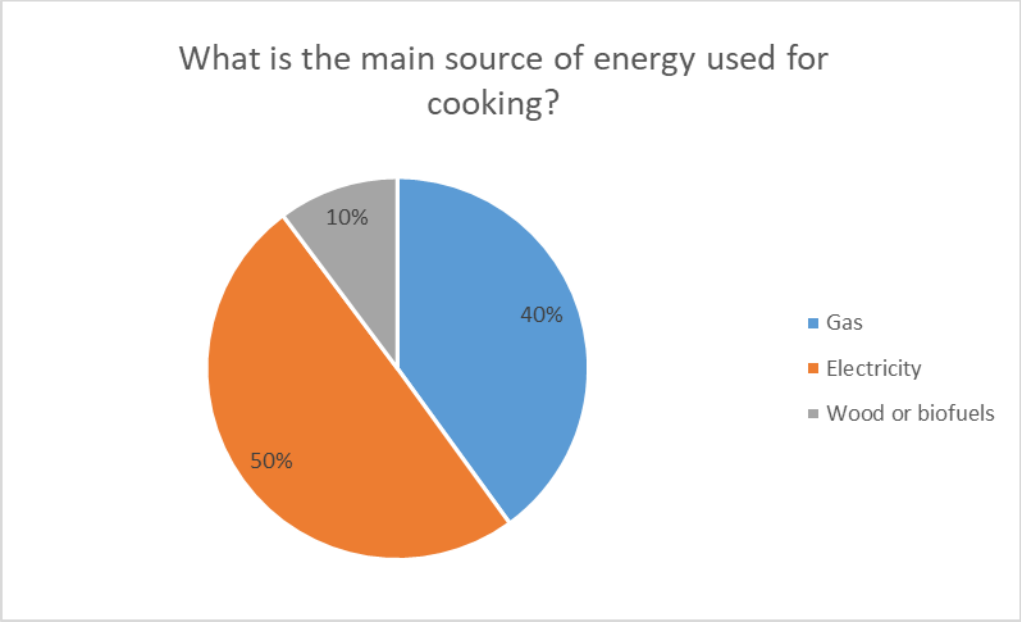
Answer: 29% of the interviewers, responded they are neutral, 24% responded they are satisfied, 27% responded are unsatisfied and only 11% very satisfied.

Q15: What is the main source of heating at your house?



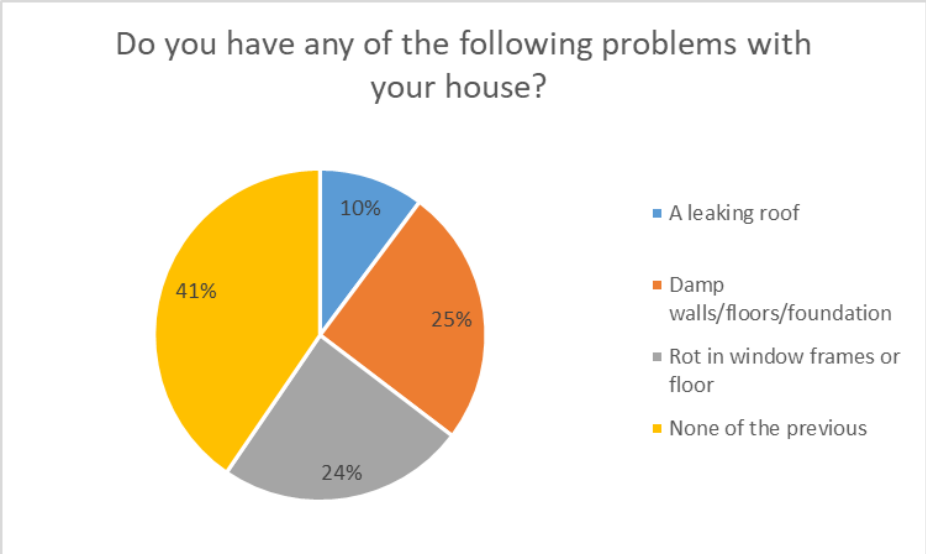
Answer: 38% of the interviewers responded they use electricity, 25% use wood or biofuel, 22% use gas, 4% use burning oil.

Q16: What is the main source of energy used for cooking?



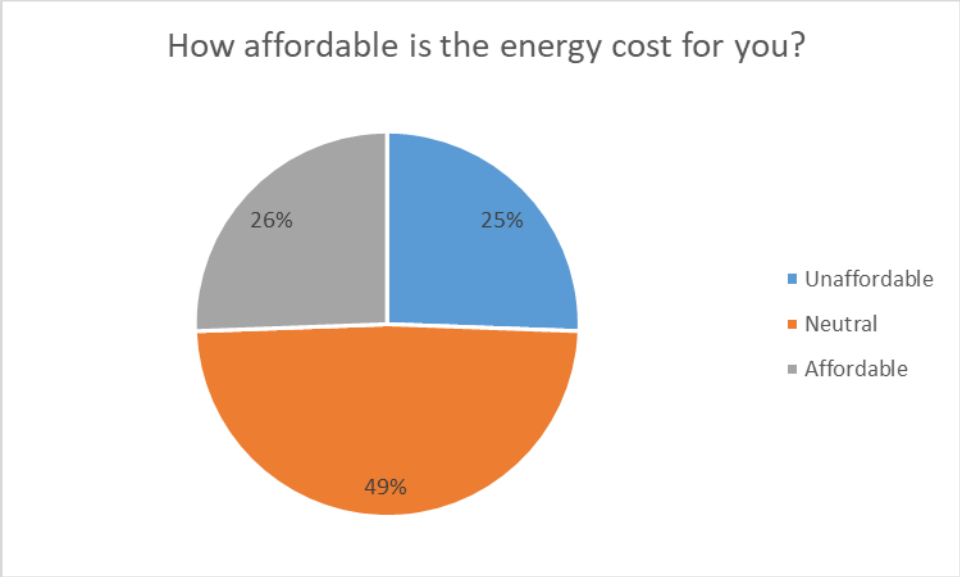
Answer: 50% of the interviewers responded they use electricity, 40% use gas, and only 10% use wood or wood.

Q17: Do you have any of the following problems with your house?



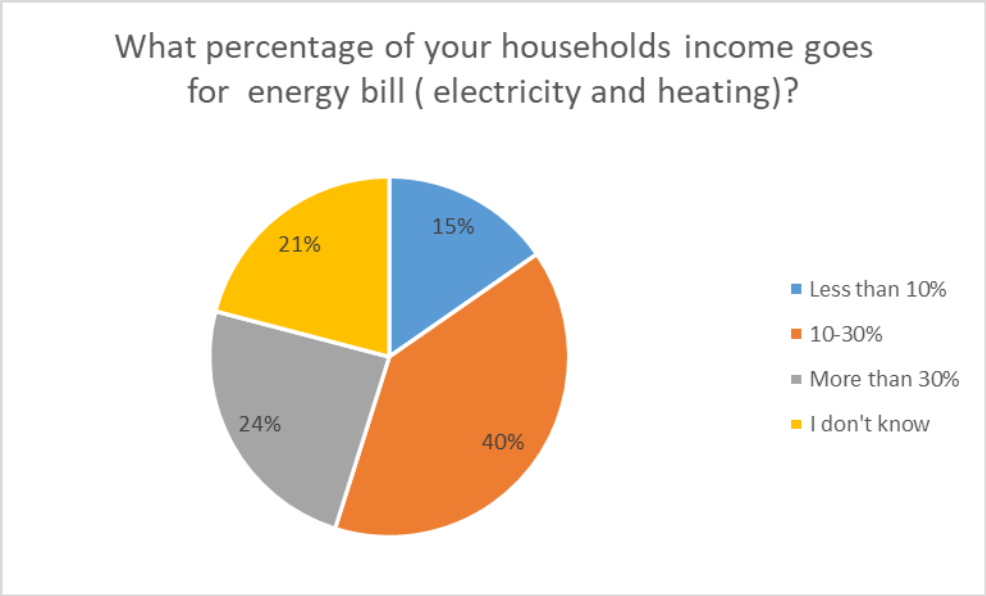
Answer: 41% of the interviewers responded they do not have problems, 24% have issues with rot in window frames or floor, 25% issues in damp walls, floors/foundations, 10% issues with leaking roofs.

Q18: How affordable is the energy cost for you?



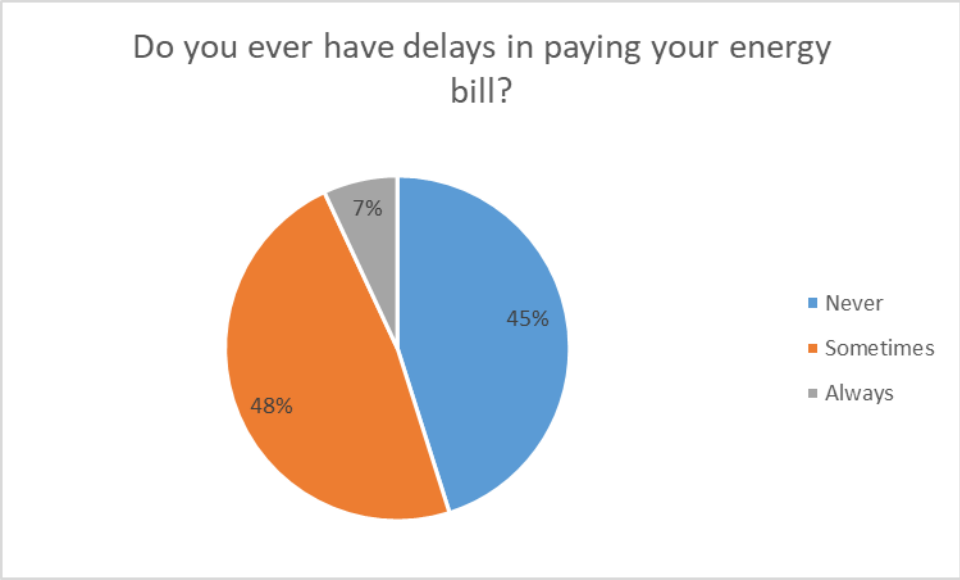
Answer: 49% of the interviewers responded neutral where they were asked for the energy bill, 25% have responded the energy bill is unaffordable, 26% answered the energy bill is affordable.

Q19: What percentage of your household's income goes for energy bill (electricity and heating)?



Answer: 40% of the interviewers responded that their incomes that goes for the energy bill is 30% of the overall salary, 24% responded is more than 30%, 21% responded don't have this information and 15% less than 10% goes for energy bill.

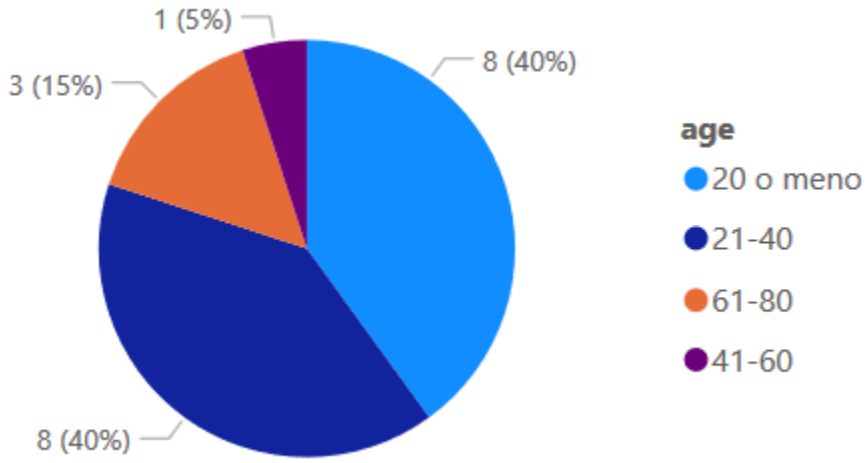
Q20: Do you ever have delays in paying your energy bill?



Answer: 48% of the interviewers responded that they sometimes have delays with energy bill, 45% responded never and 7% responded always have delays with payment of the energy bill.

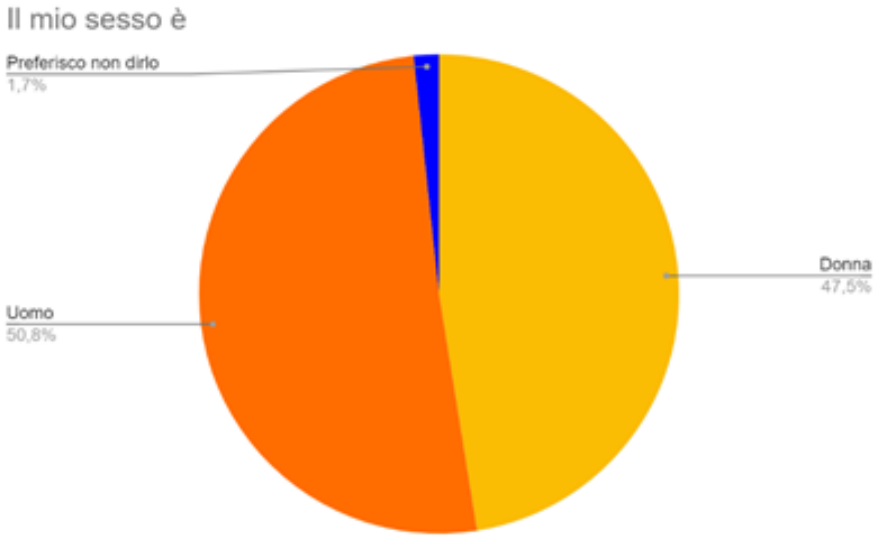
Annex III – Results for the energy poverty assessment in Italy

Q1: What is your age?



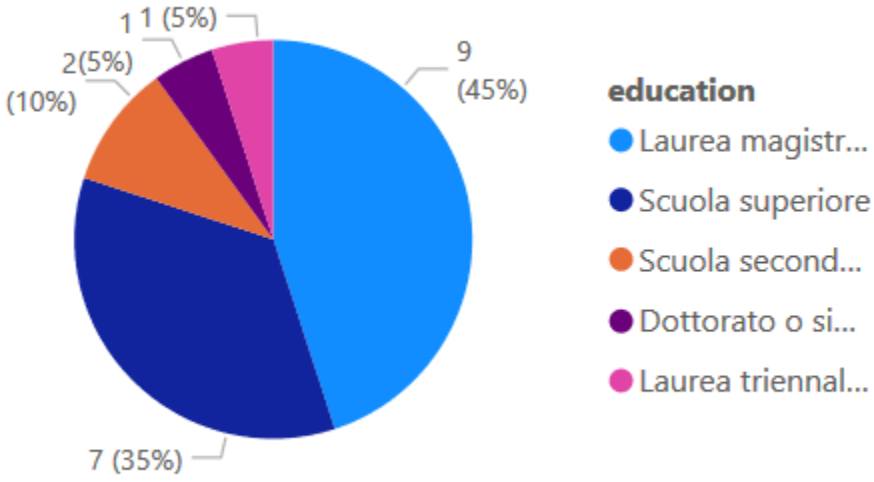
Answer: among the respondents, it has been found that 40% are between 21 and 40 years old. The remaining ones are between 41 and 60 years old (5%), between 61 and 80 years old (15%), and 20 or younger 40%. None of them is older than 81.

Q2: What is your gender?



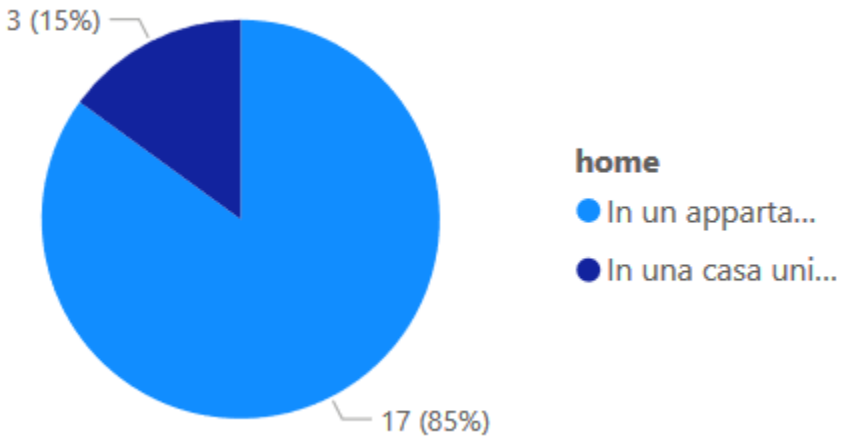
Answer: as a result, 50.8% of the respondents are men, 47.5% are women, and 1.7% prefered not to say.

Q3: What is the education level of the breadwinner(s) in the family?



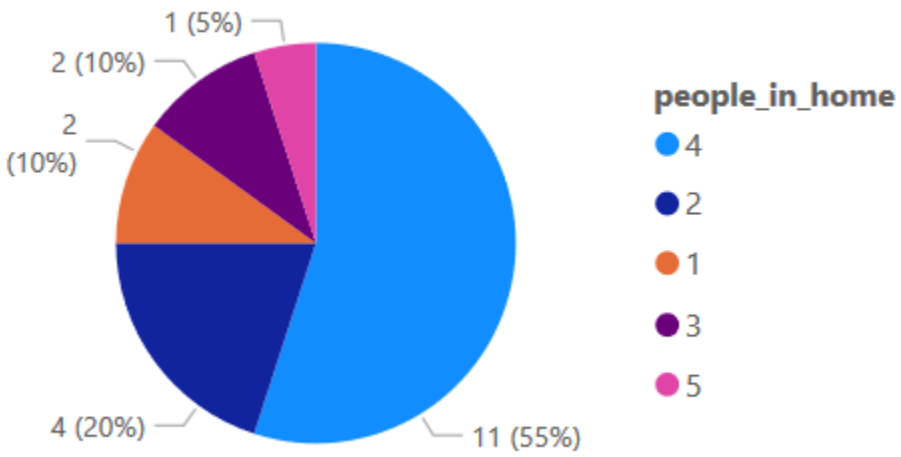
Answer: the educational level of the breadwinner(s) is the following: 35% have a high school diploma, 45% have a master's degree or similar, 10% have a secondary school diploma below high school, 5% have a bachelor's degree or similar and, finally, the remaining 1% has a doctoral degree or similar.

Q4: Where do you live?



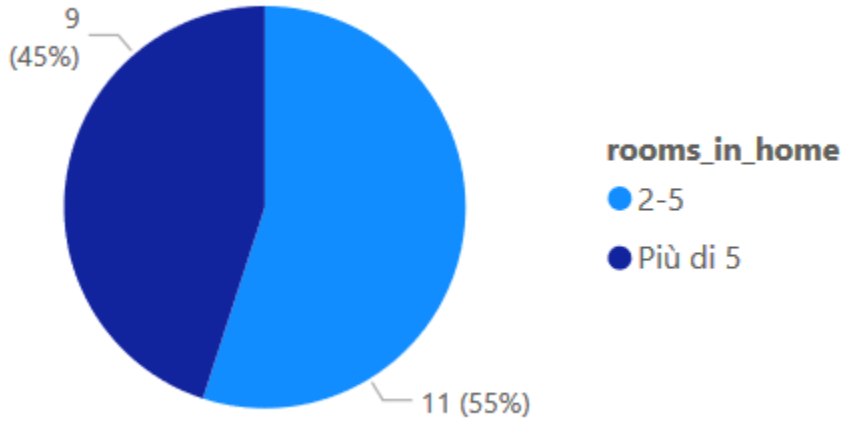
Answer: GETA webapp: as a result, 85% of the respondents live in a flat, while 15% live in a single-family house.

Q5: How many people are living at your house?



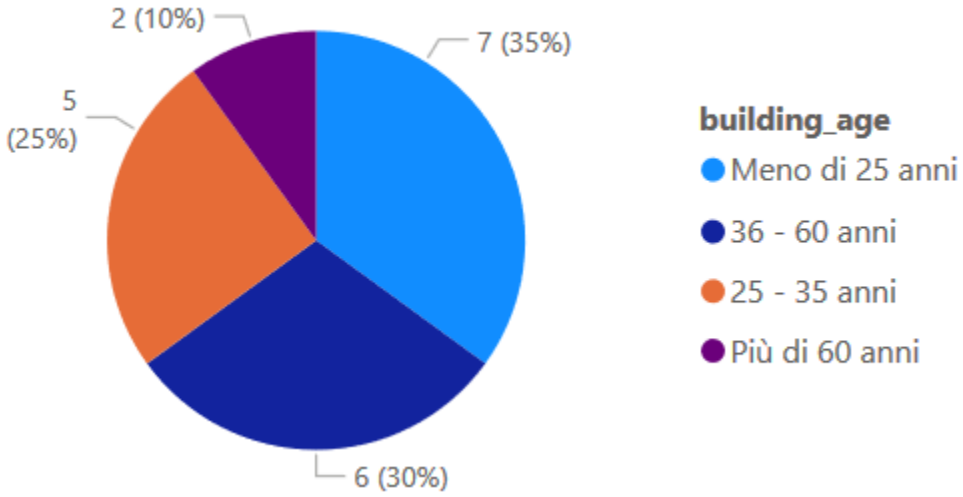
Answer: **GETA webapp:** most of the respondents answered that the number of people living in their home is equal to 4 (55%) or 2 (20%), while 10% answered that they live in 3, and 10% live alone. Finally, 5% of the people stated that 5 people live at home.

Q6: How many rooms do you have at your house?



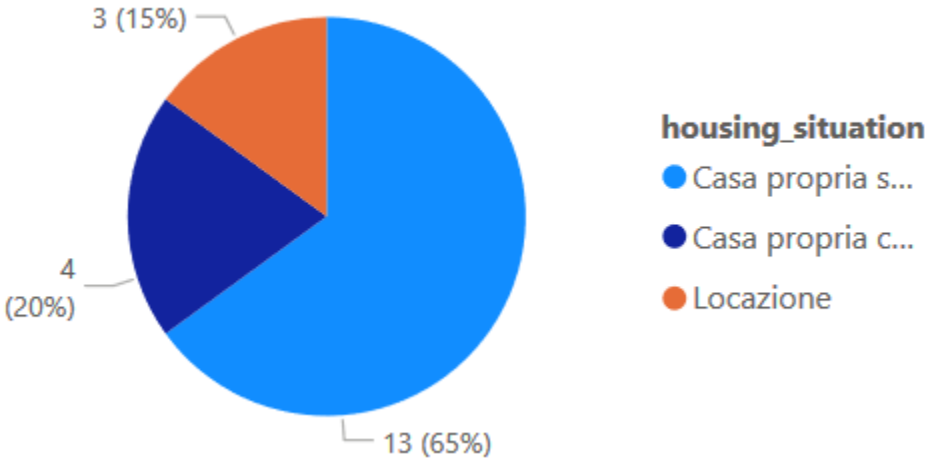
Answer: Among the respondents, 45% of them have more than 5 rooms in their house, while the remaining 55% have between 2 and 5 rooms. None of them has only one room.

Q7: What is the age of construction of your house?



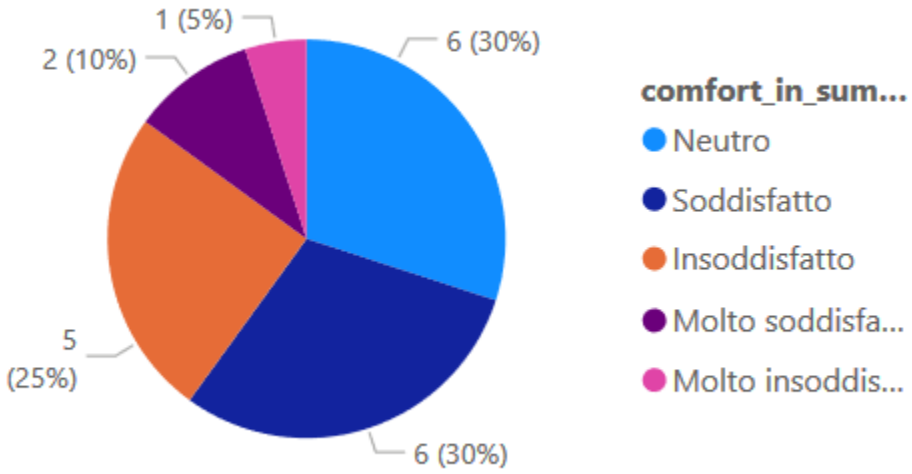
Answer: most of the respondents (35%) live in a building that is less than 25 years old, 30% in a building that is between 36 and 60 years old, 25% in a building that is between 25 and 35 years old, and 10% in a building that is more than 60 years old.

Q8: What is the status of ownership of your house?



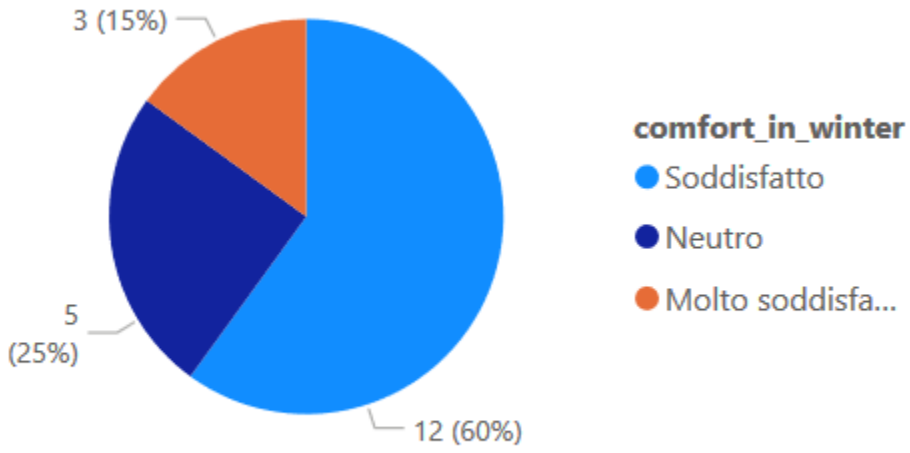
Answer: As a result, 65% of the respondents live in their own home without a mortgage, 20% in their own home with a mortgage, and the remaining 15% in a house with a lease.

Q9: What is your opinion regarding the level of comfort (temperature) in your house during the summer time?



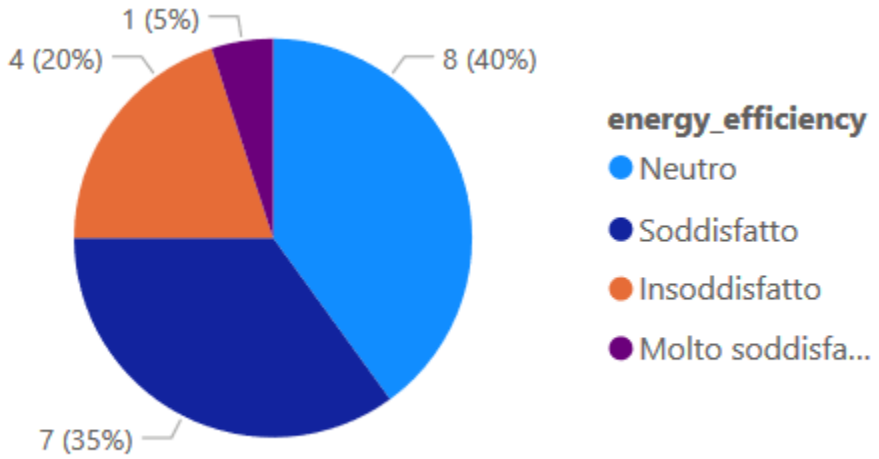
Answer: as a result, 30% of respondents are satisfied with the level of comfort (temperature) in their home during the summer period, 10% are very satisfied, 30% are neutral, 25% are dissatisfied, and 5% are very dissatisfied.

Q10: What is your opinion regarding the level of comfort (temperature) in your house during the winter time?



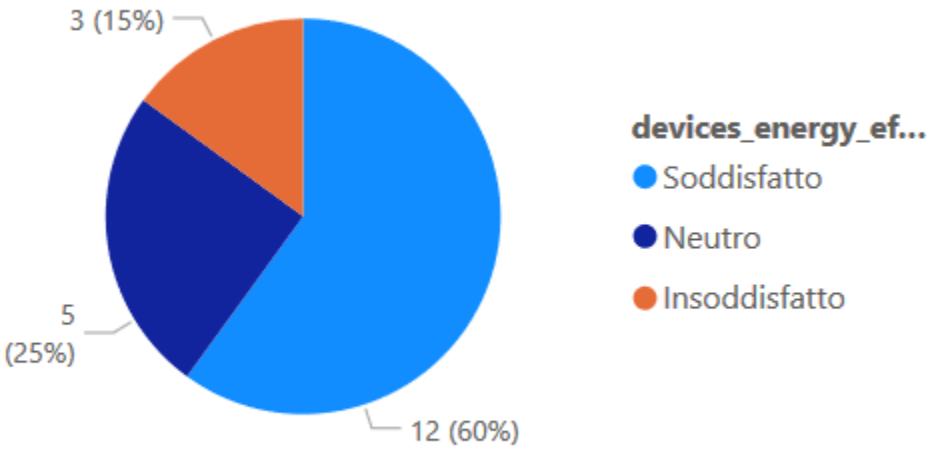
Answer: GETA webapp: compared to the summer case, 60% of the respondents are satisfied with the comfort level (temperature) of their home in the winter period, 15% are very satisfied, and 25% are neutral.

Q11: What is your opinion regarding the level of energy efficiency of your house?



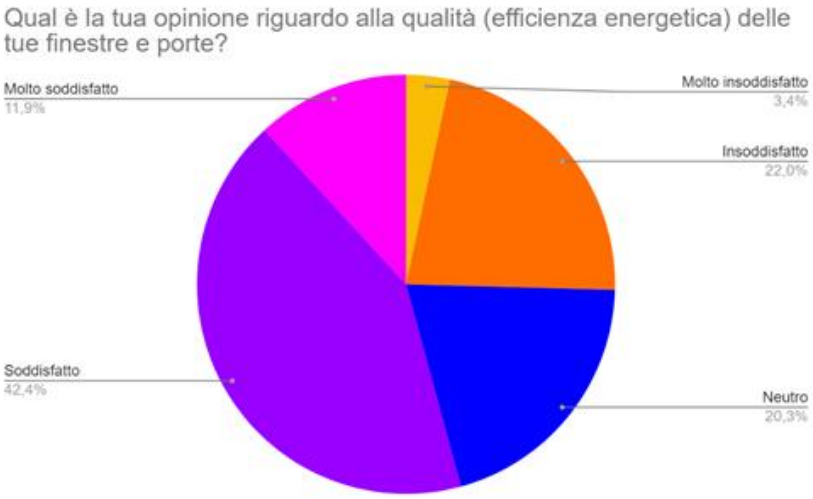
Answer: among the respondents, 40% consider themselves neutral about the level of energy efficiency of their building, 35% are satisfied, 5% are very satisfied, 20% are dissatisfied.

Q12: What is your opinion regarding the level of energy efficiency of your devices?



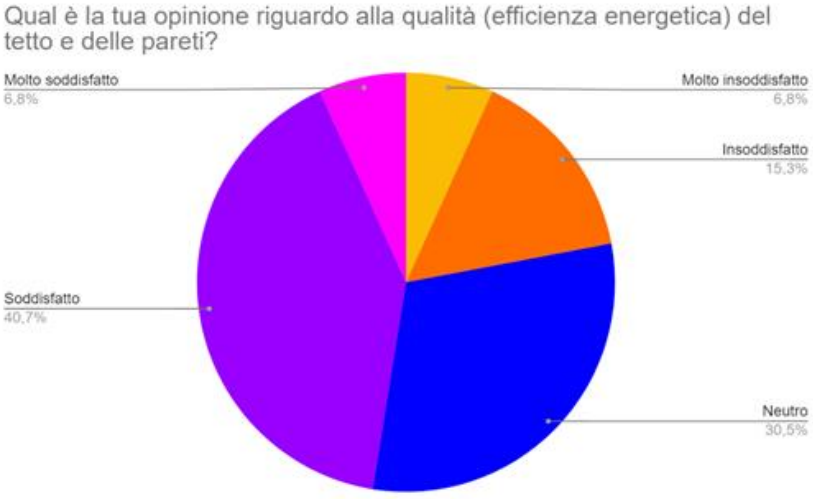
Answer: GETA webapp: concerning the energy efficiency of the respondents' devices, 60% of the respondents were satisfied, 25% were neutral, and 15% were dissatisfied. None of them considered themselves very dissatisfied.

Q13: What is your opinion regarding the quality (energy efficiency) of your windows and doors?



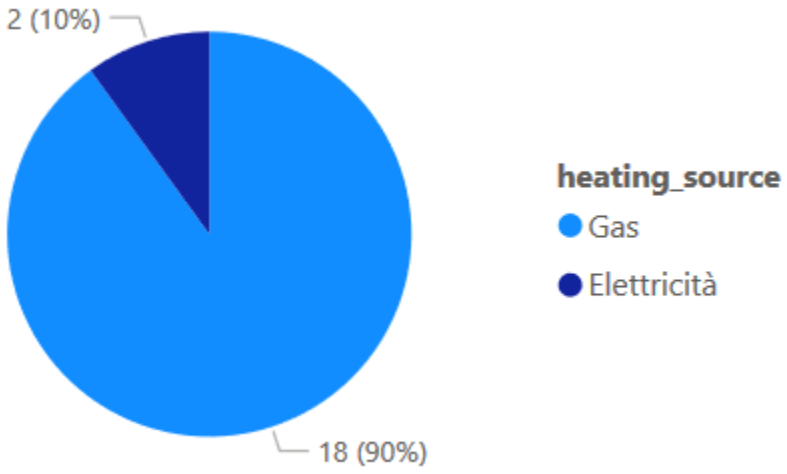
Answer: concerning the quality (energy efficiency) of the building's doors and windows of the respondents, 42.4% of the respondents considered themselves satisfied, 20.3% were neutral, 11.9% were very satisfied, 22.0% were dissatisfied, and the remaining 3.4% were very dissatisfied.

Q14: What is your opinion regarding the quality (energy efficiency) of your roofs and walls



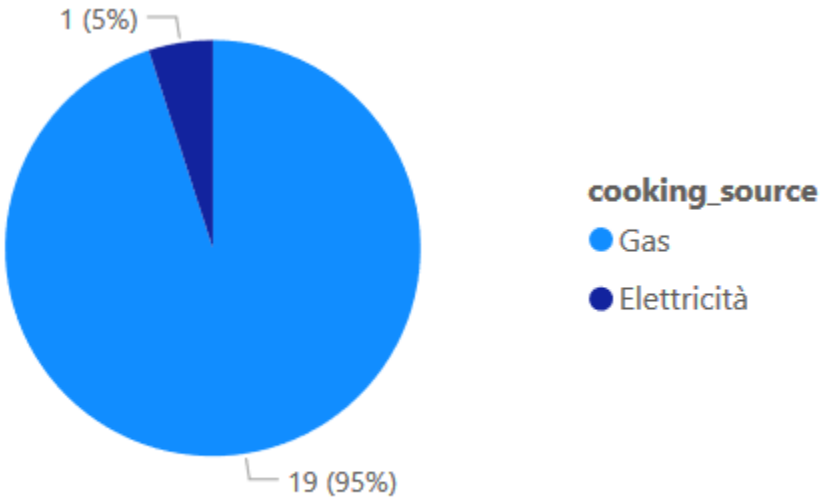
Answer: energy poverty tool and GETA webapp: concerning the quality (energy efficiency) of the roof and walls of the building of the respondents, 40.7% were satisfied, 30.5% were neutral, 15.3% were dissatisfied, 6.8% were very satisfied and, similarly, 6.8% were very dissatisfied.

Q15: What is the main source of heating at your house?



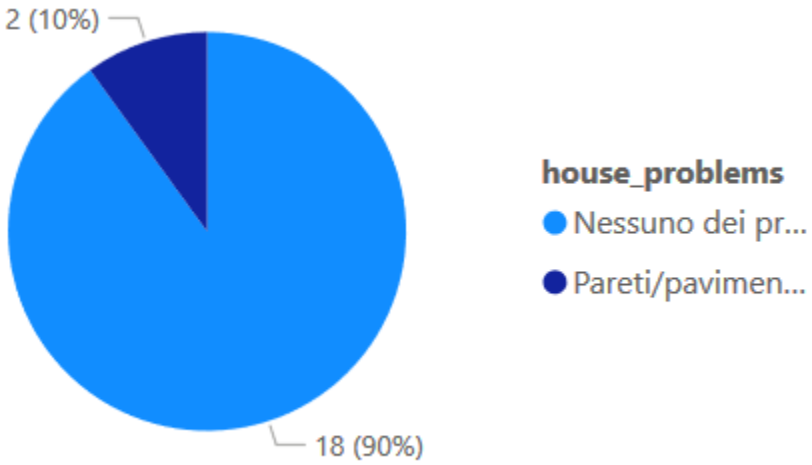
Answer: GETA webapp: among the respondents, 90%, have gas as their main heating source, 10% use electricity.

Q16: What is the main source of energy used for cooking?



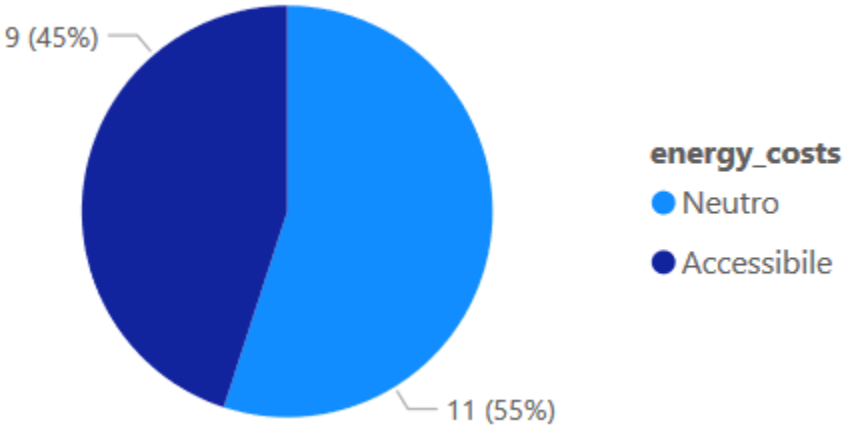
Answer: GETA webapp: as a result, 95% of the respondents use gas for cooking, while the remaining 5% use electricity. None of them uses wood or biofuels.

Q17: Do you have any of the following problems with your house?



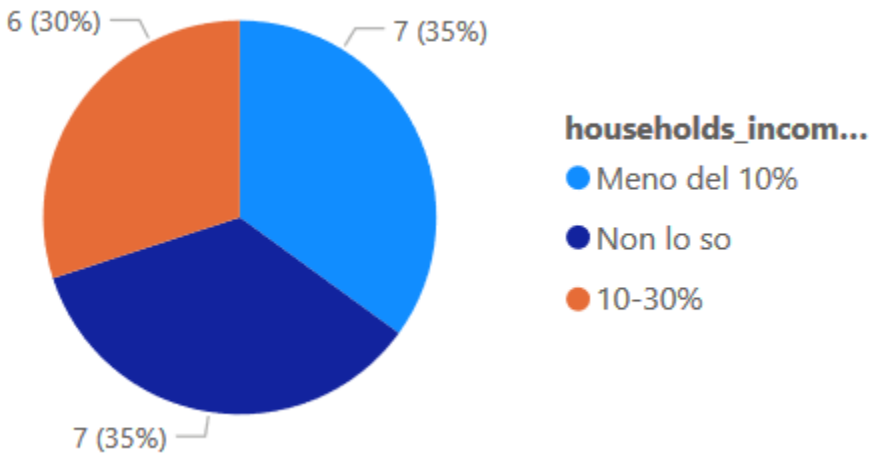
Answer: among the most common problems occurring in a dwelling, i.e. a leaking roof, damp walls/floors/foundations, rotting in window frames or on the floor, the majority of respondents answered that 90% do not experience any of these problems in their dwelling, 10% have damp walls/floors/foundations.

Q18: How affordable is the energy cost for you?



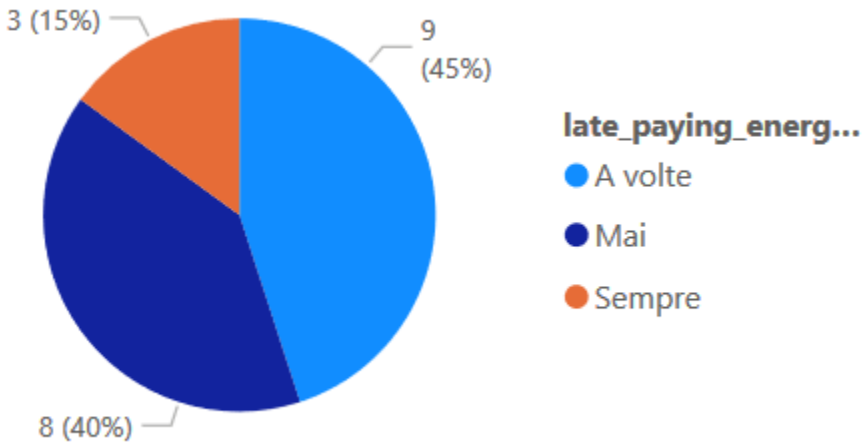
Answer: GETA webapp: as a result, 45% of the respondents considered the level of energy costs for their home to be affordable, 55% considered it neutral.

Q19: What percentage of your household's income goes for energy bill (electricity and heating)?



Answer: among the respondents, 30% stated that is between 10% and 30% of the household income is used for energy costs, 35% stated that is less than 10%, and 35% do not know.

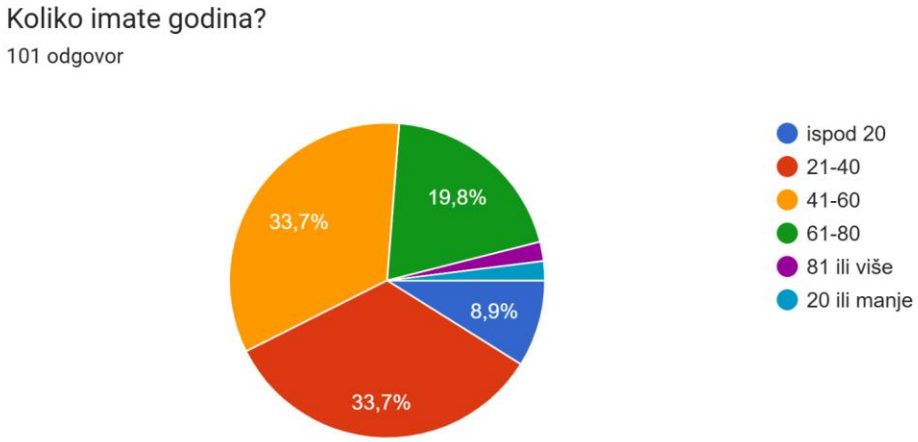
Q20: Do you ever have delays in paying your energy bill?



Answer: GETA webapp: 40%, are never late in paying their energy bills (electricity and heating), 45% are sometimes late, and 15% are always late.

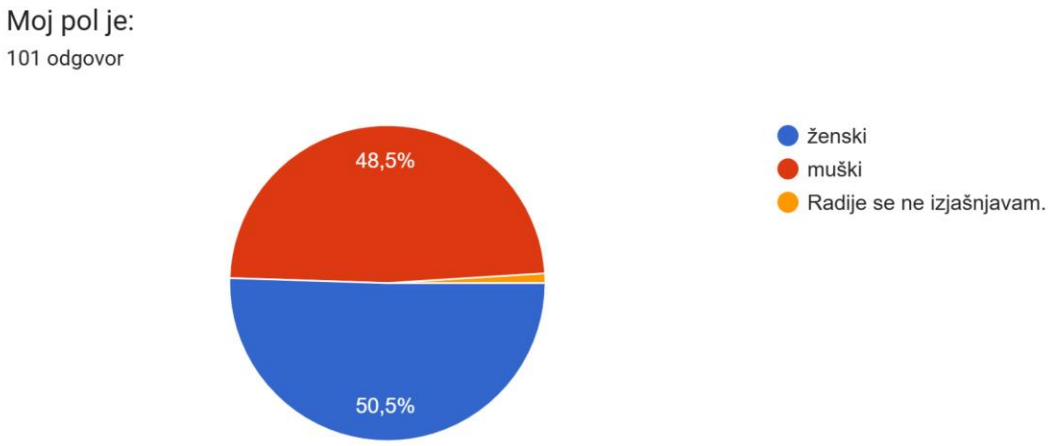
Annex IV – Results for the energy poverty assessment in BiH

Q1: What is your age?



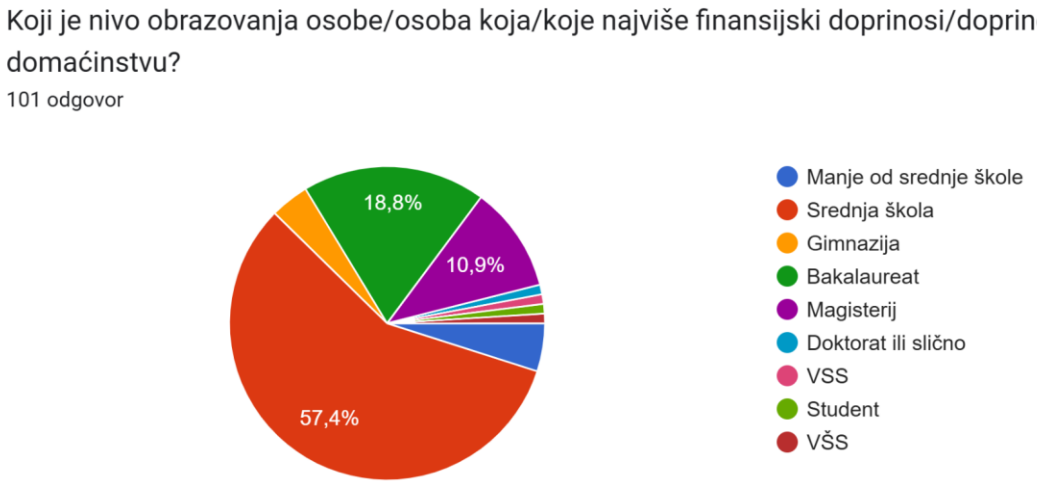
Answer: It has been found there are 33.7% of respondents per each age range: 21-40 years old and 41-60 years. The remaining ones are between 61 and 80 years old (19.8%), 20 or younger (8.9%) and 80+ years old (2%).

Q2: What is your gender?



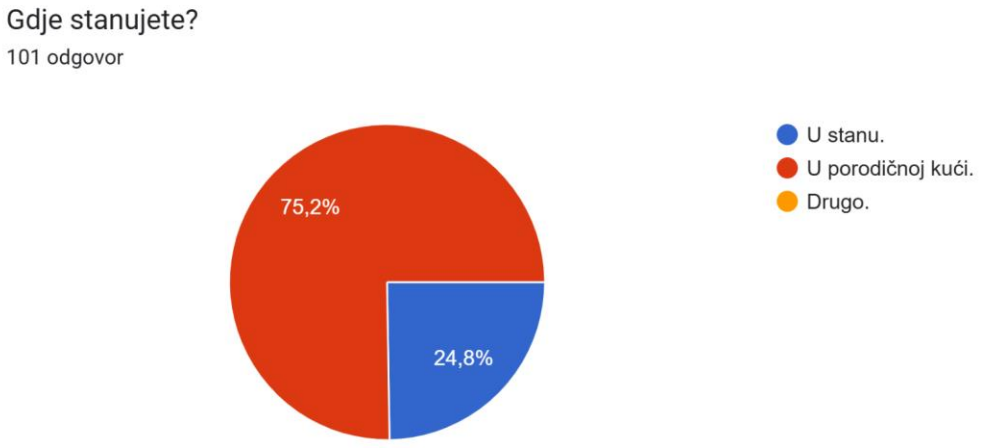
As a result, 50.5% of the respondents are women, 48.5% are women, and 1% preferred not to say.

Q3: What is the education level of the breadwinner(s) in the family?



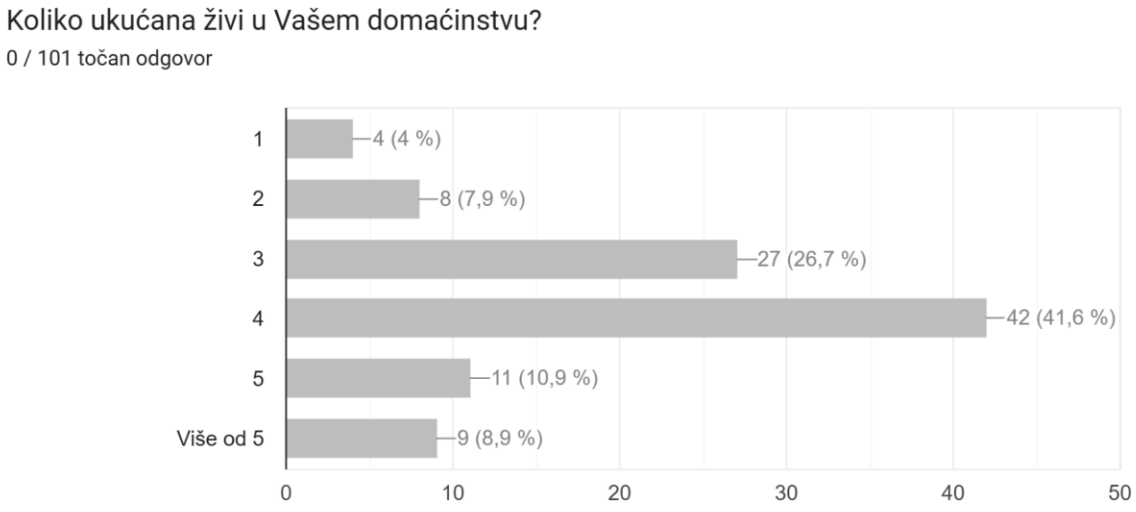
Answer: The educational level of the breadwinner(s) is the following: 59.5% have a high school diploma, 18.8% have a master's degree or similar, 5.3% have a lower than upper secondary degree below high school, 10.9% have a bachelor's degree or similar and, 4.5% completed gymnasium and the remaining 1% have a doctoral degree or similar.

Q4: Where do you live?



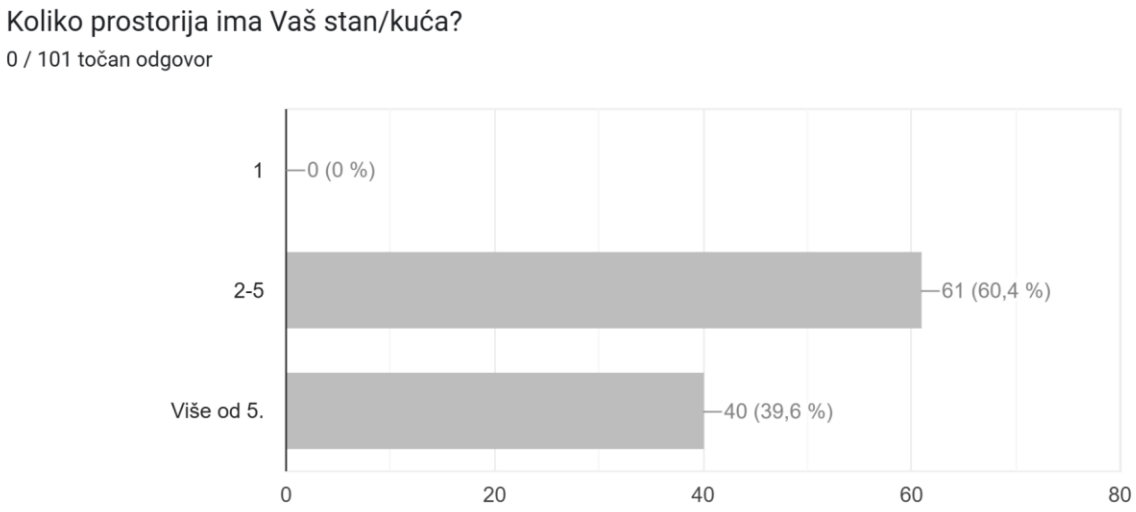
75.2% of the respondents live in a single-family house, while 24.8% live in a flat.

Q5: How many people are living at your house?



Answer: Most of the respondents answered that the number of people living in their home is equal to 4 (41.6%) or 3 (26.7%), while 10.9% answered that they live in 5, 8.9% live in more than 5 members' households. Finally, 7.9% of the people stated that 2 persons live at home, and only 4% live alone.

Q6: How many rooms do you have at your house?

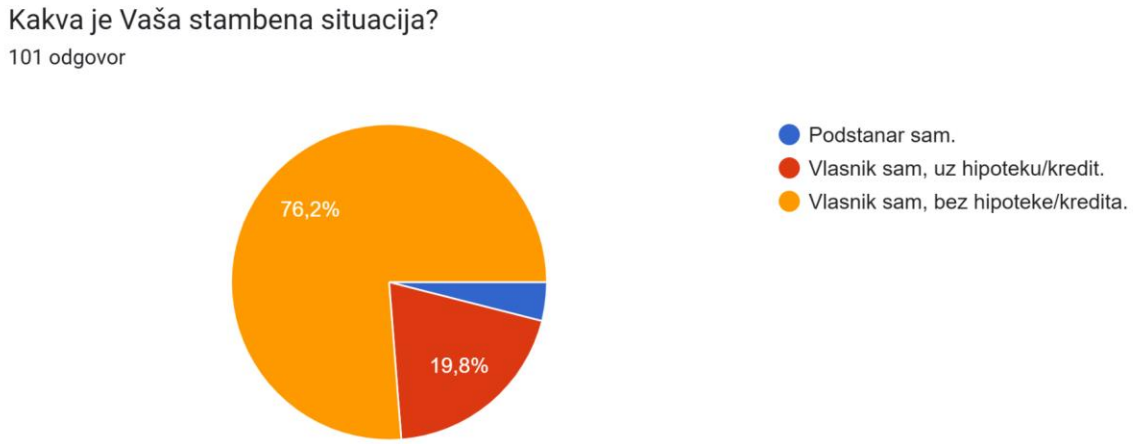


Answer: Among the respondents,60.4% of them have between 2 and 5 rooms in their house, while the remaining 39.6% have more than 5 rooms. None of them has only one room.

Q7: What is the age of construction of your house?

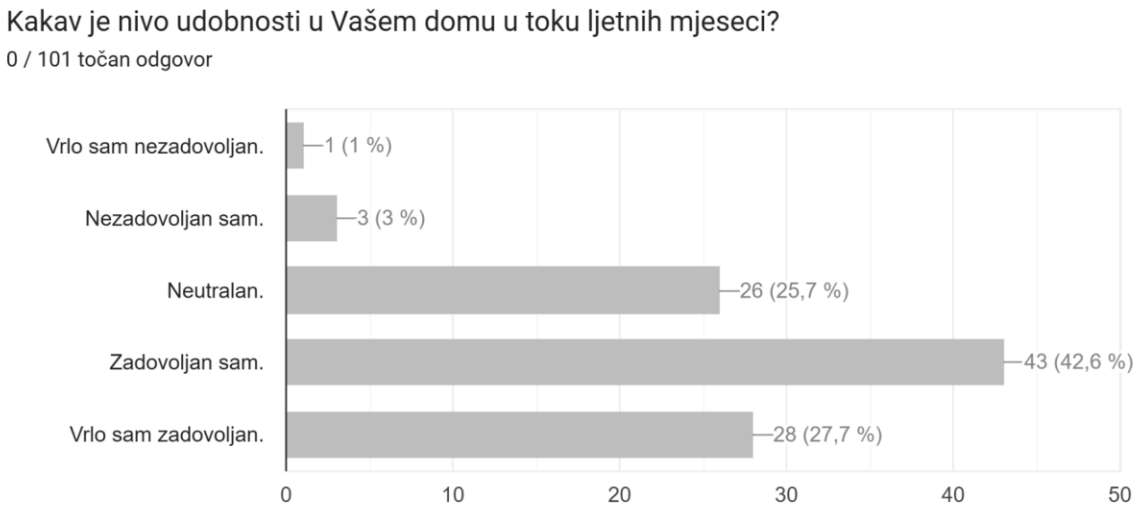
Answer: Most of the respondents (35.6%) live in a building that is between 36 and 60 years old, 33.7% live in a building that is between 25 and 35 years old, 20.8% in a building that is less than 25 years old, and 9.9% in a building that is more than 60 years old.

Q8: What is the status of ownership of your house?



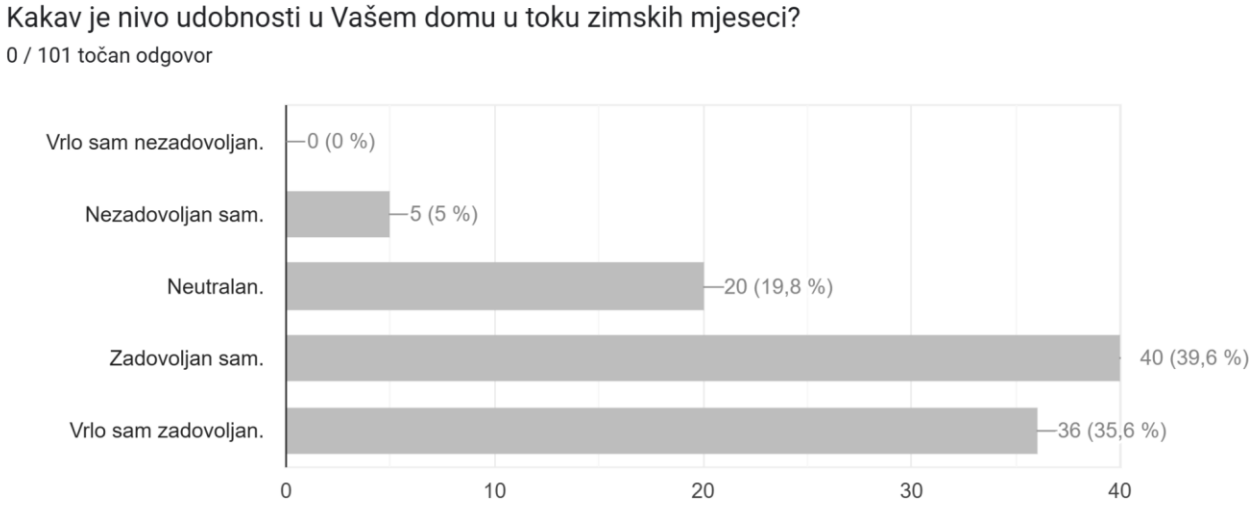
Answer: As a result, 76.2% of the respondents live in their own home without a mortgage, 19.8% in their own home with a mortgage, and the remaining 4% in a house with a lease.

Q9: What is your opinion regarding the level of comfort (temperature) in your house during the summer time?



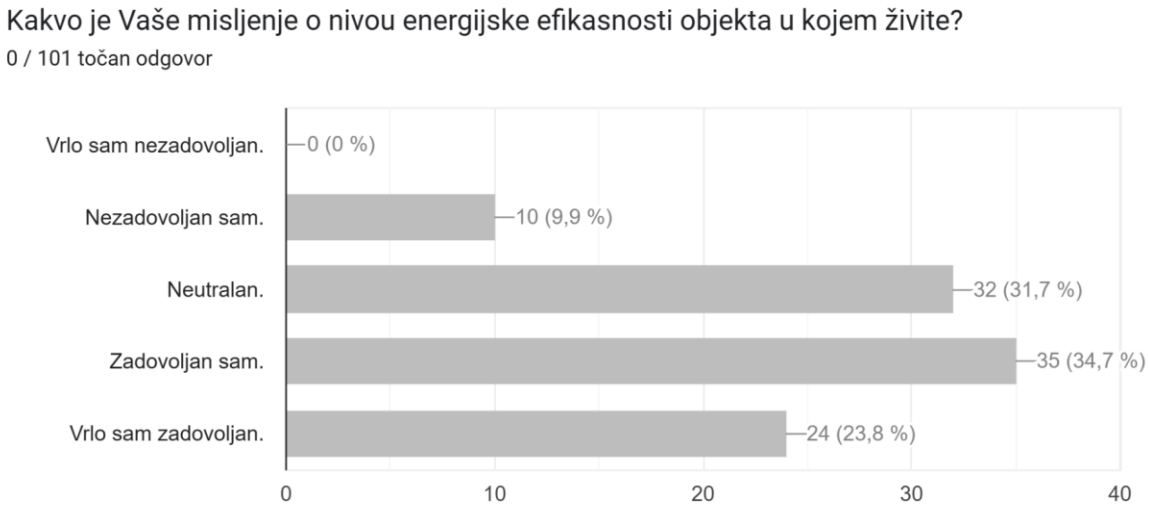
Answer: As a result, 42.6% of respondents are satisfied with the level of comfort (temperature) in their home during the summer period, 27.7% are very satisfied, 25.7% are neutral, 3% are dissatisfied, and only 1% are very dissatisfied.

Q10: What is your opinion regarding the level of comfort (temperature) in your house during the winter time?



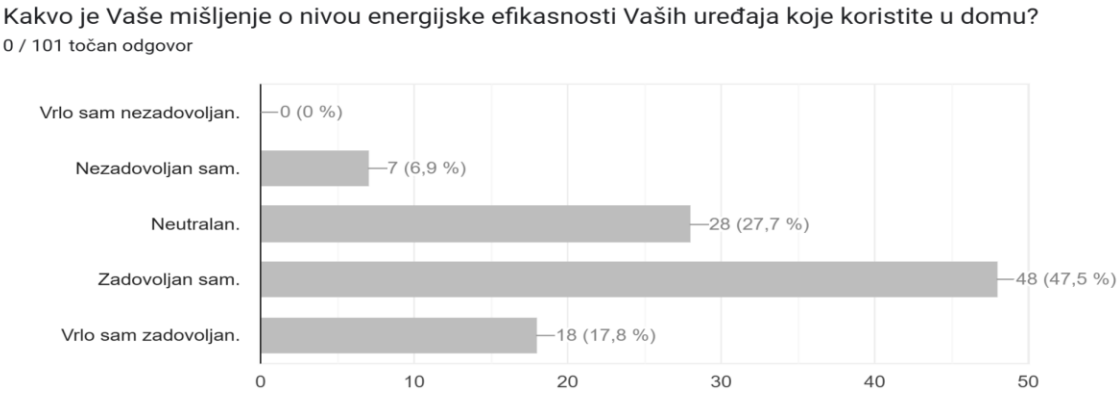
Answer: According to the survey, 39.6% of the respondents are satisfied with the comfort level (temperature) of their home in the winter period, 35.6% are very satisfied, 19.8% are neutral, 5% are dissatisfied. No respondents declared as are very dissatisfied.

Q11: What is your opinion regarding the level of energy efficiency of your house?



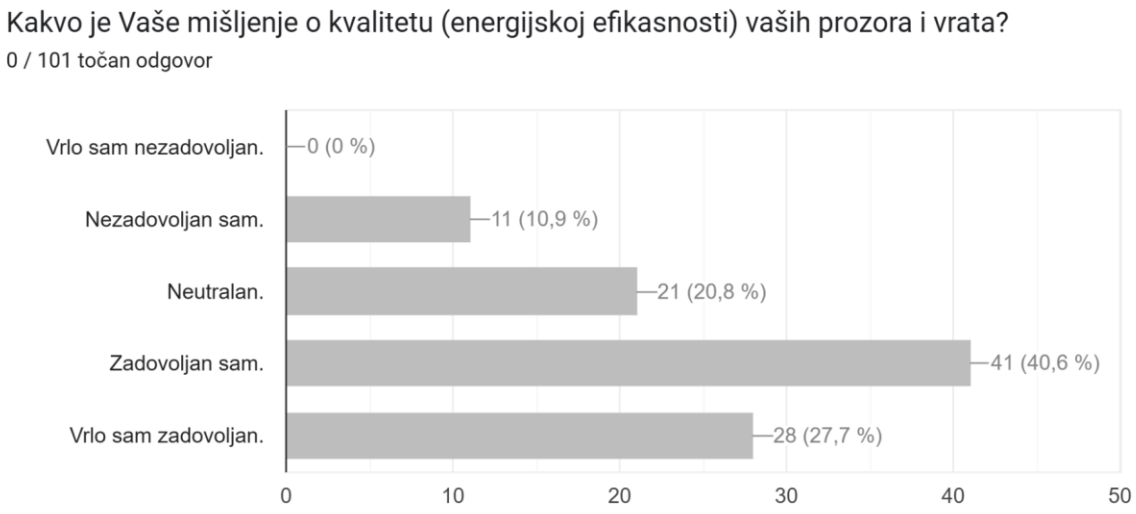
Answer: Among the respondents, 34.7% consider themselves satisfied about the level of energy efficiency of their building, 31.7% are neutral, 23.8% are very satisfied, 9.9% are dissatisfied. No respondents declared as very dissatisfied.

Q12: What is your opinion regarding the level of energy efficiency of your devices?



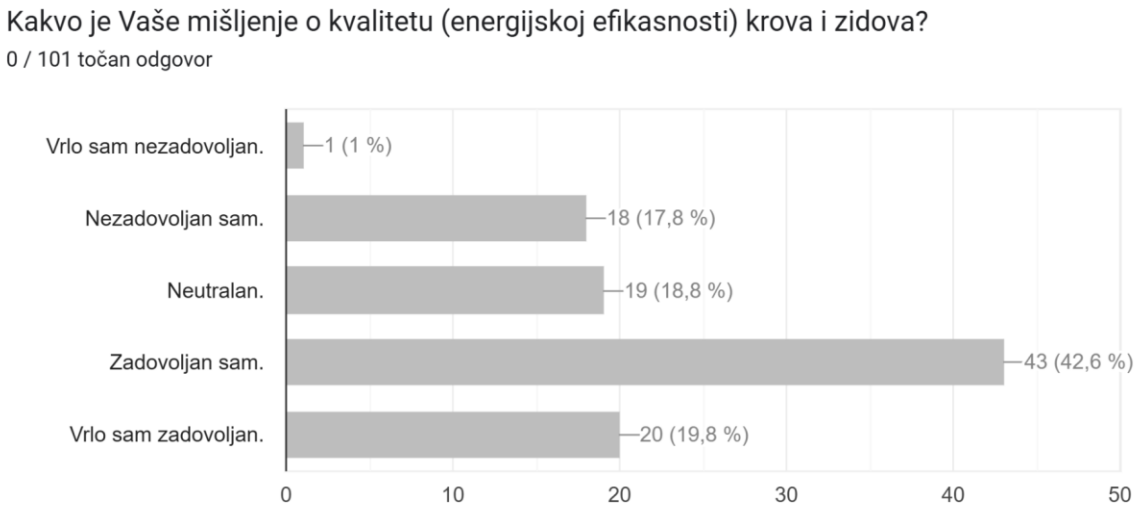
Answer: Concerning the energy efficiency of the respondents' devices, 47.5% of the respondents were satisfied, 27.7% were neutral, 17.8% were very satisfied, and 6.9% were dissatisfied. None of them considered themselves very dissatisfied.

Q13: What is your opinion regarding the quality (energy efficiency) of your windows and doors?



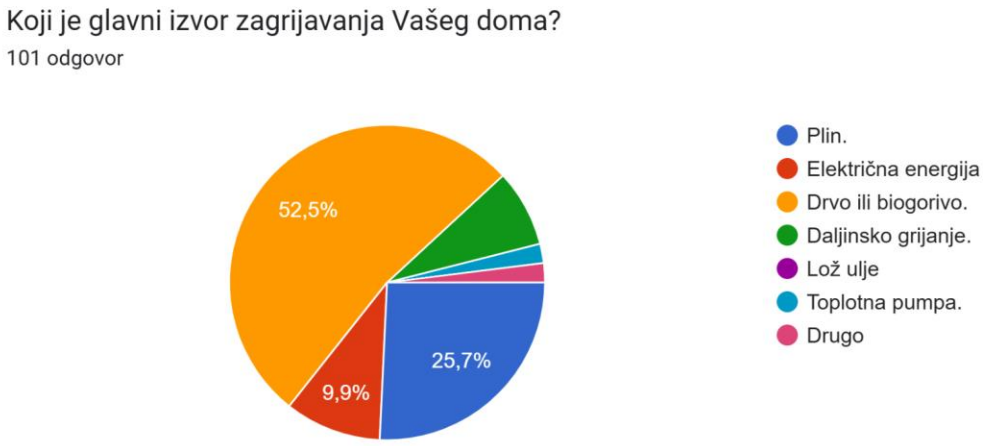
Answer: Concerning the quality (energy efficiency) of the building's doors and windows of the respondents, 40.6% of the respondents considered themselves satisfied, 27.7% were very satisfied, 20.8% were neutral, 10.7% were dissatisfied, and none was very dissatisfied.

Q14: What is your opinion regarding the quality (energy efficiency) of your roofs and walls?



Answer: Concerning the quality (energy efficiency) of the roof and walls of the building of the respondents, 42.6% were satisfied, 19.8% were very satisfied, 18.8% were neutral, 17.8% were very dissatisfied and only 1% were very dissatisfied.

Q15: What is the main source of heating at your house?

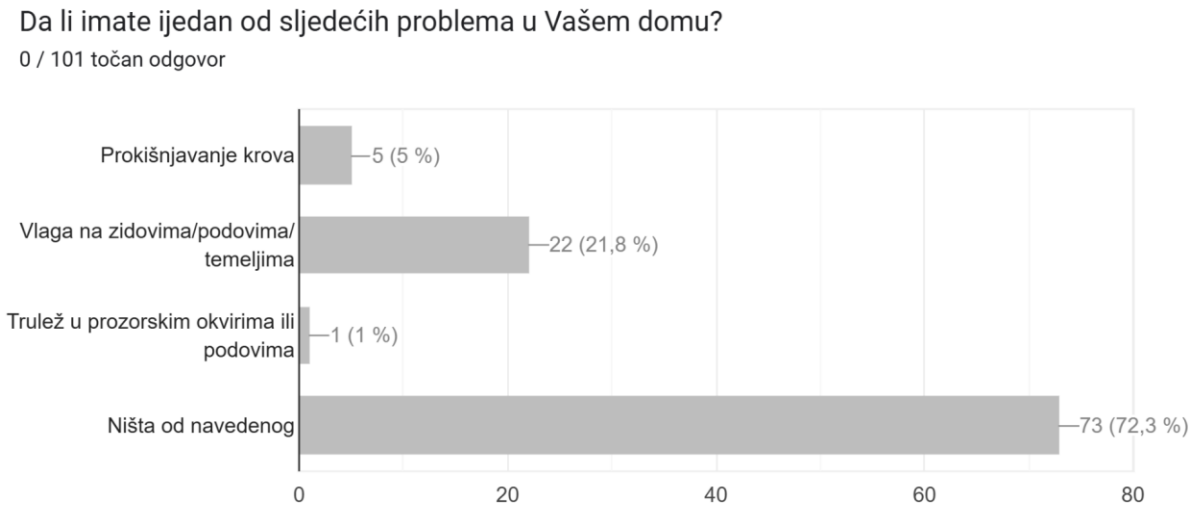


Answer: Among the respondents, 52.5%, use wood or biofuel as their main heating source, 25.7% use gas, 9.9% use electricity, 7.9% are connected to district heating, 2% use heat pumps, and 2% other than the ones specified above.

Q16: What is the main source of energy used for cooking?

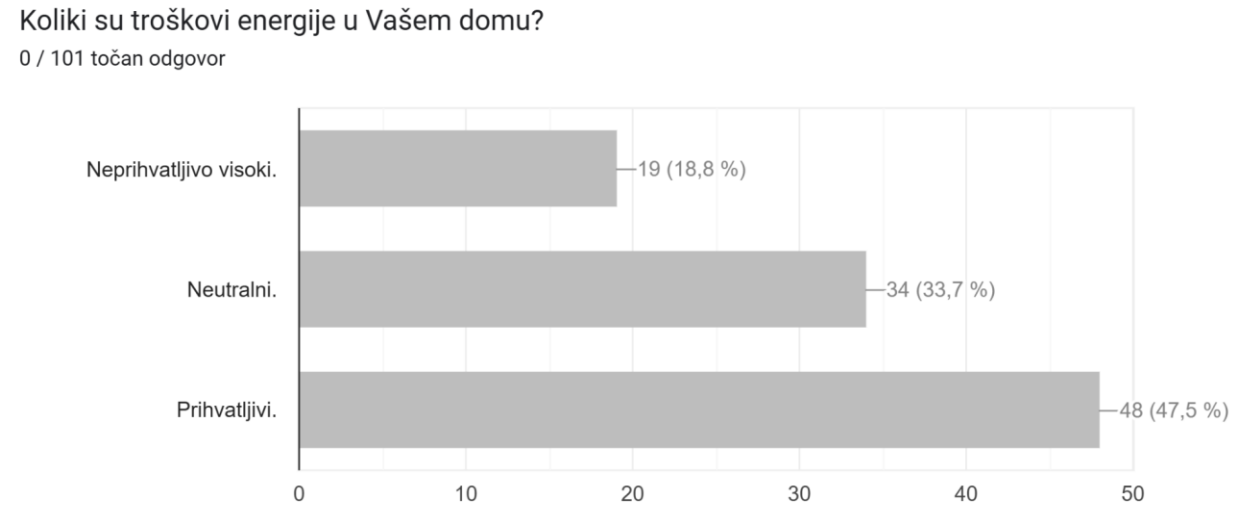
Answer: The majority of the respondents 62.4% use electricity for cooking, 25.7% use gas, while the remaining 11.9% use wood or biofuels.

Q17: Do you have any of the following problems with your house?



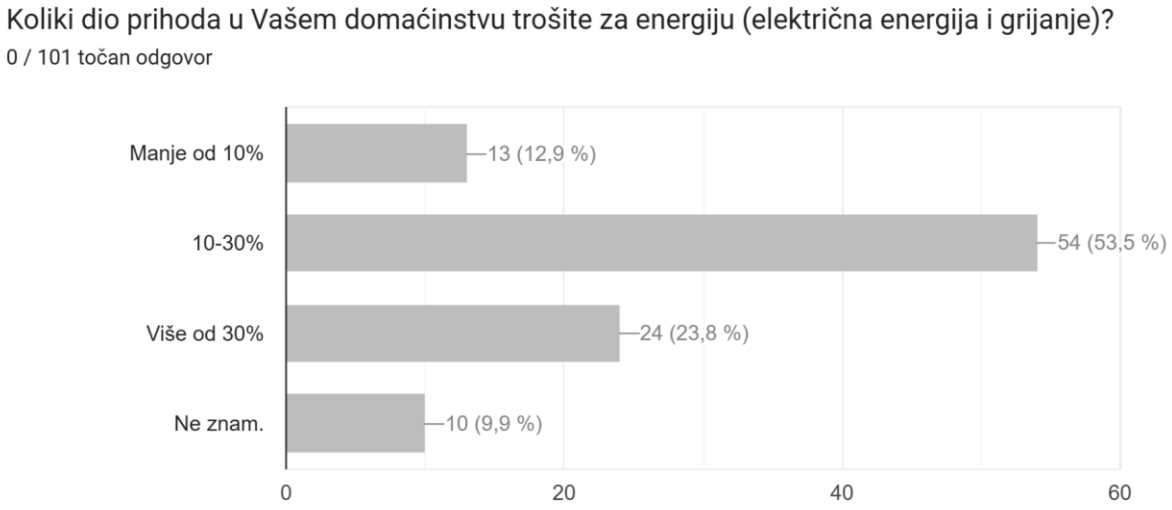
Answer: Among the most common problems occurring in a dwelling, i.e. a leaking roof, damp walls/floors/foundations, rotting in window frames or on the floor, the majority of respondents answered that 72.3% do not experience any of these problems in their dwelling, 21.8% have damp walls/floors/foundations, 5% have a leaking roof and 1% have the problem of rotting in window frames or on the floor.

Q18: How affordable is the energy cost for you?



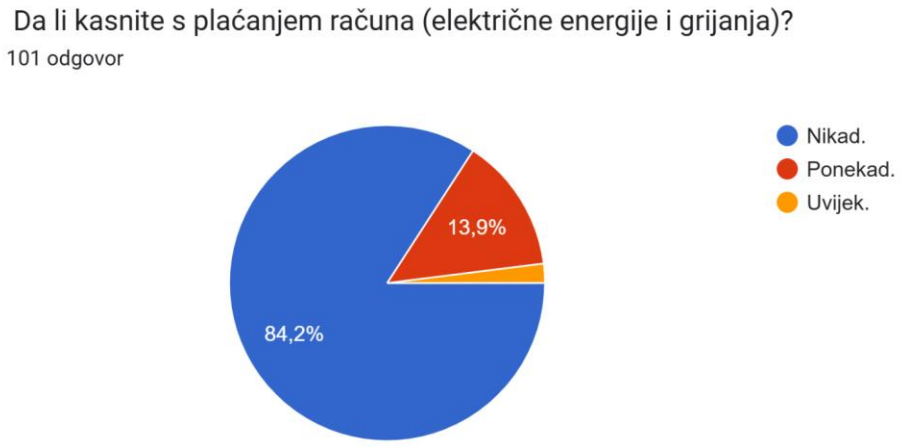
Answer: As a result, 47.5% of the respondents considered the level of energy costs for their home to be affordable, 33.7% considered it neutral, and 18.8% considered it unaffordable.

Q19: What percentage of your household's income goes for energy bill (electricity and heating)?



Answer: Among the respondents, 53.5% spend 10% and 30% of the household income is used for energy costs, 23.8% spend more than 30% of total income, 12.9% stated its less than 10% and 9.9% did not know what proportion of household income is used for energy costs.

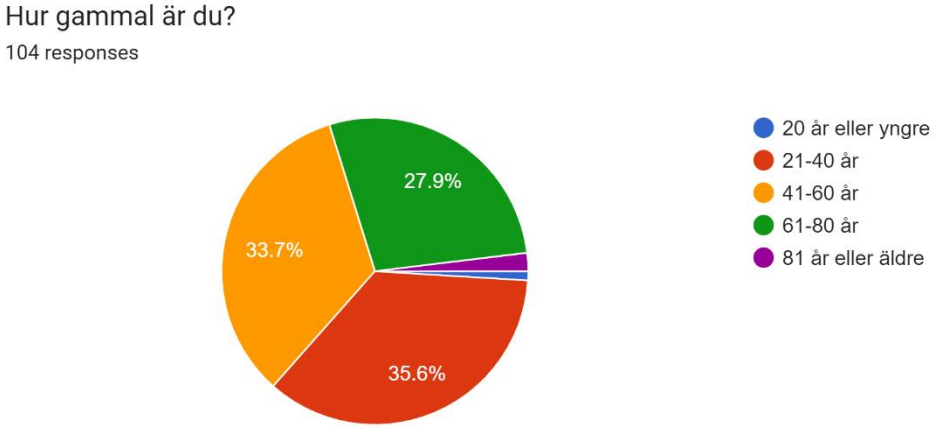
Q20: Do you ever have delays in paying your energy bill?



Answer: Most respondents, precisely 84.2% of them, are never late in paying their energy bills (electricity and heating), 13.9% are sometimes late, and only 2% are always late.

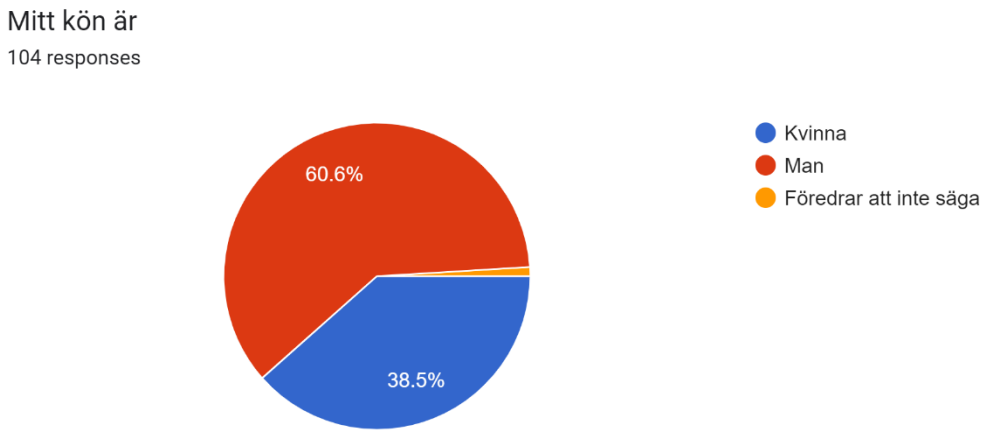
Annex V – Results for the energy poverty assessment in Sweden

Q1: What is your age?



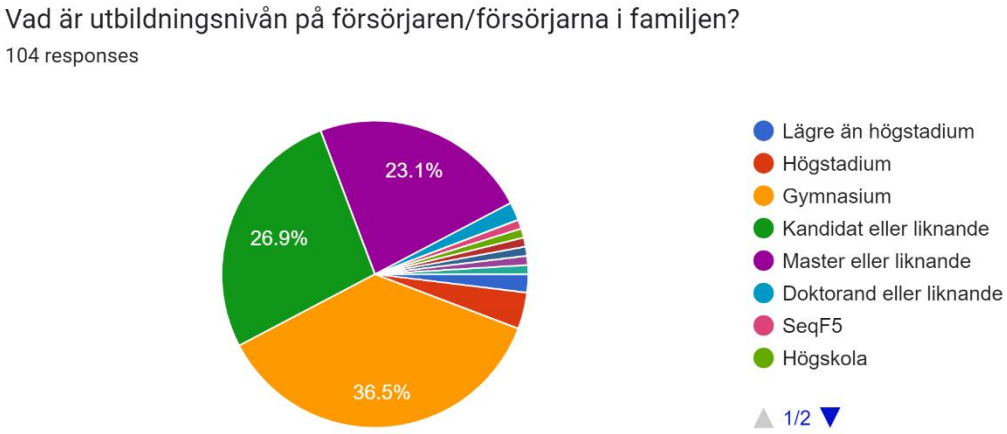
Answer: The result shows that 35,6% of the respondents are between 21-40 years old, 33,7% are 41-60 years old, 27,9% between 61-80 years old and the remaining ones are 1% are 20 years or younger or 1,9% are 81 years and older.

Q2: What is your gender?



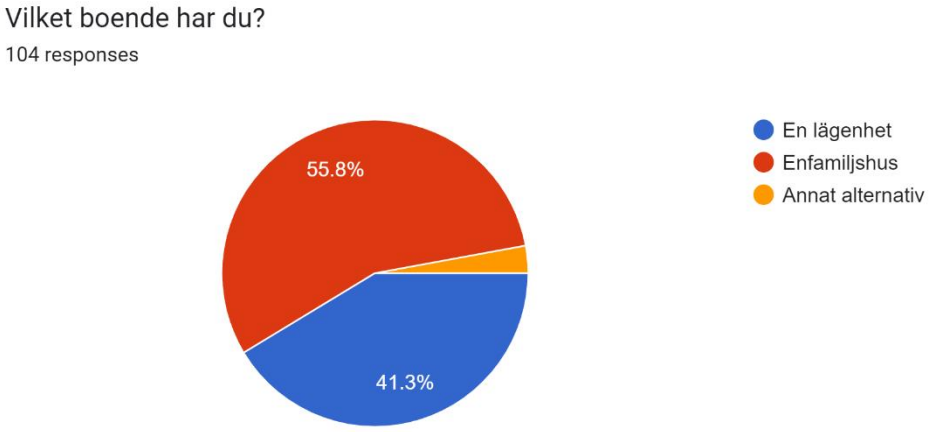
Answer: Most of the respondents were male (60,6 %), 38,5% were women and 0,9% preferred not to say.

Q3: What is the education level of the breadwinner(s) in the family?



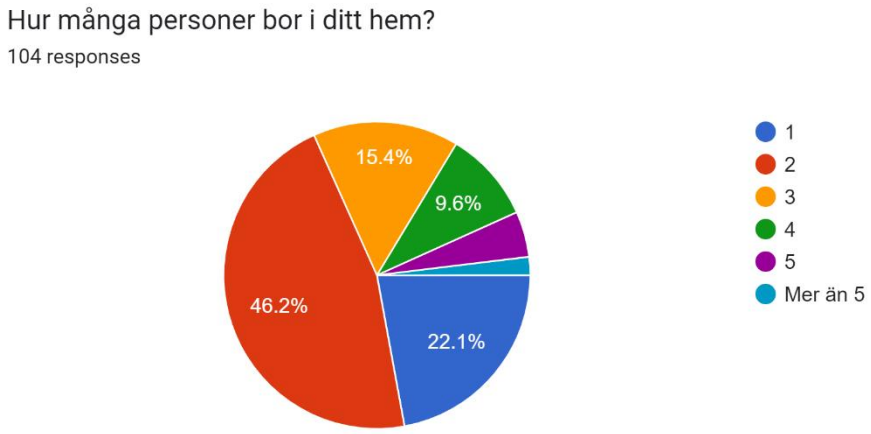
Answer: The educational level of the breadwinner(s) is the following: 36,5% have gymnasium, 26,9% has bachelor's degree or similar, 23,1% has master's degree, high school 3,8%, PhD student or similar 1,9%, 1,9% lower than upper secondary school, 1% university and 4,9% other.

Q4: Where do you live?



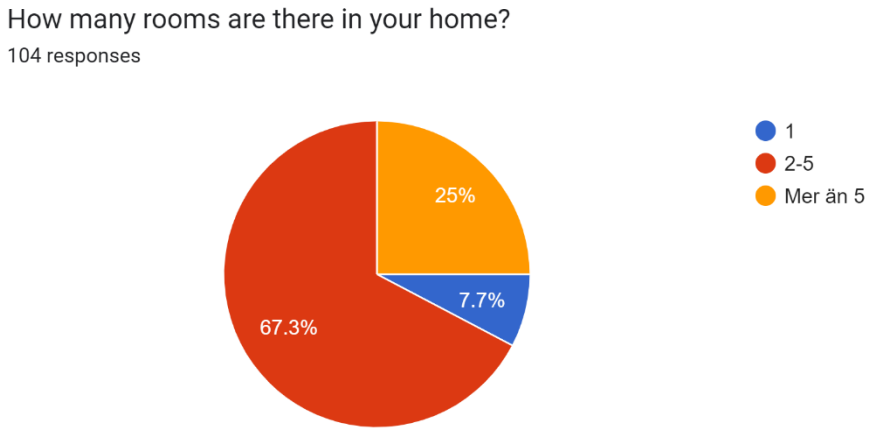
Answer: 55,8% of the respondents live in a one family house and 41,3% live in an apartment only 2,9% have a different alternative to these two.

Q5: How many people are living at your house?



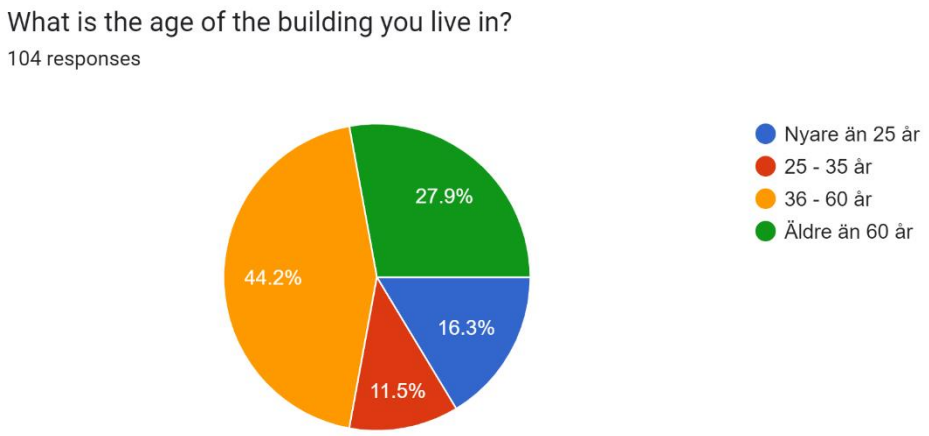
Answer: 46,2% of the respondents replied that they were 2 people living in their household, 22,1% were single households, 15,4% answered that they live with 3 persons and 9,6% replied having 4 family members in the same house, 4,8% live with five family members and 1,9% live with more than five family members.

Q6: How many rooms do you have at your house?



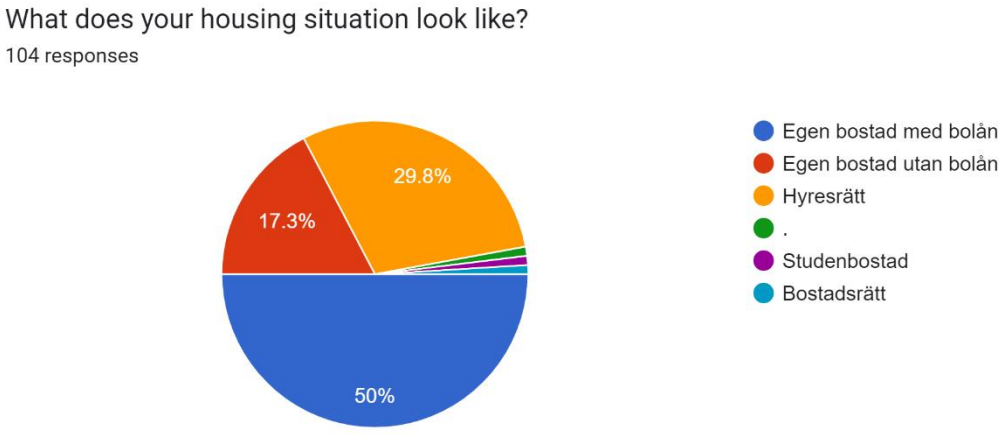
Answer: The majority of the respondents 67,3%, replied they had 2-5 rooms in their house, while 25% have more than five rooms and 7,7% only have one room.

Q7: What is the age of construction of your house?



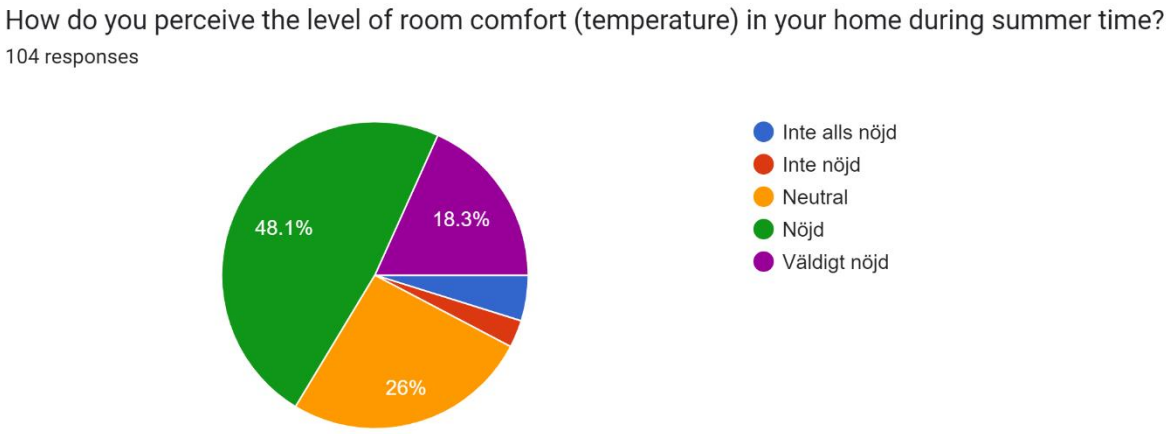
Answer: Most of the respondents (44,2%) live in a building that is between 36-60 years old, 27,9% live in a building that is older than 60 years old, 16,3% live in a building newer than 25 years and 11,5% live in a building 25-35 years old.

Q8: What is the status of ownership of your house?



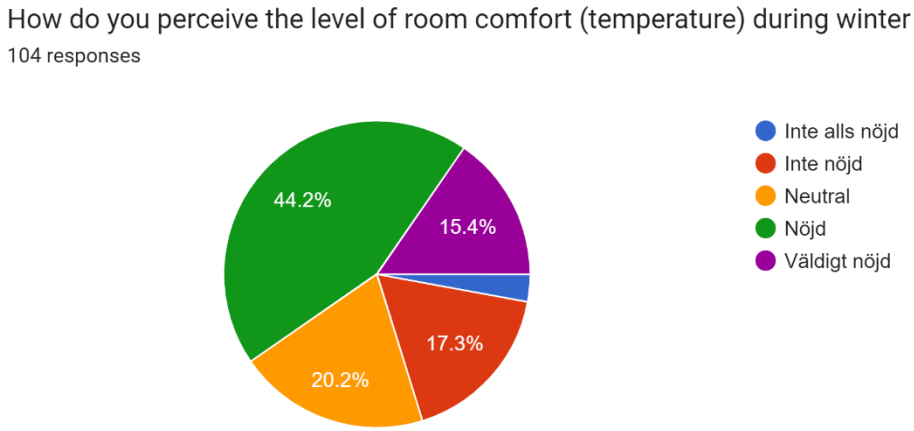
Answer: 50% of the respondents live in their own home but with mortgage, 29,8% live in a rental apartment, 17,3% live in their own home without a mortgage, 1% lives in condominium, 1% live in student housing and 1% in other.

Q9: What is your opinion regarding the level of comfort (temperature) in your house during the summer time?



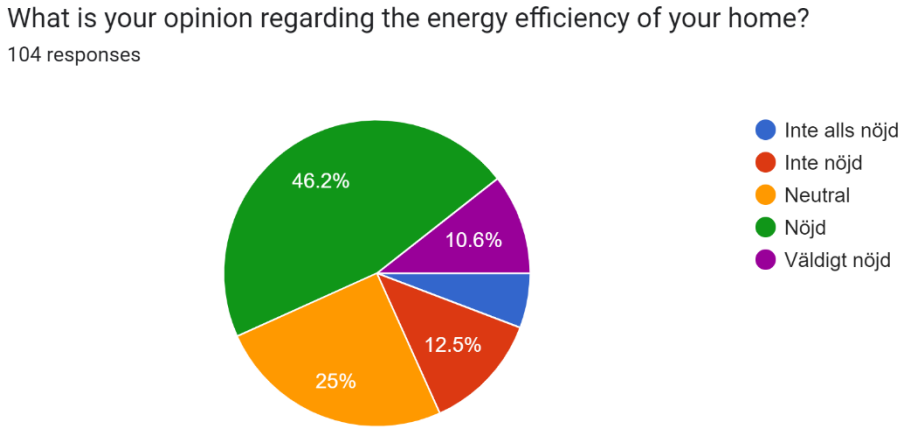
Answer: The result was that 48,1% of the respondents were satisfied with the level of comfort in their homes, 26% are neutral, 18,3% stated that they were very satisfied, 4,8% are very unsatisfied at all and 2,9% are not satisfied.

Q10: What is your opinion regarding the level of comfort (temperature) in your house during the wintertime?



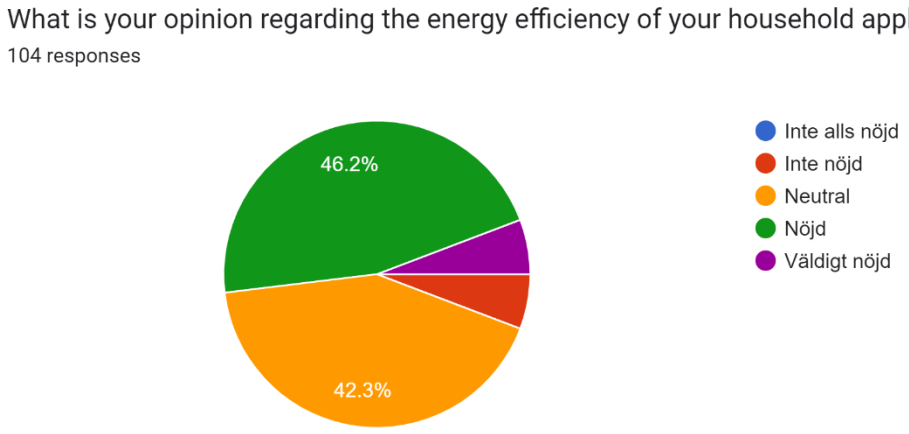
Answer: According to the survey 44,2% were satisfied with the room comfort (temperature of their home during winter, 20,2% was neutral, 17,3% were unsatisfied, 15,4% were very satisfied and 2,9% were very unsatisfied.

Q11: What is your opinion regarding the level of energy efficiency of your house?



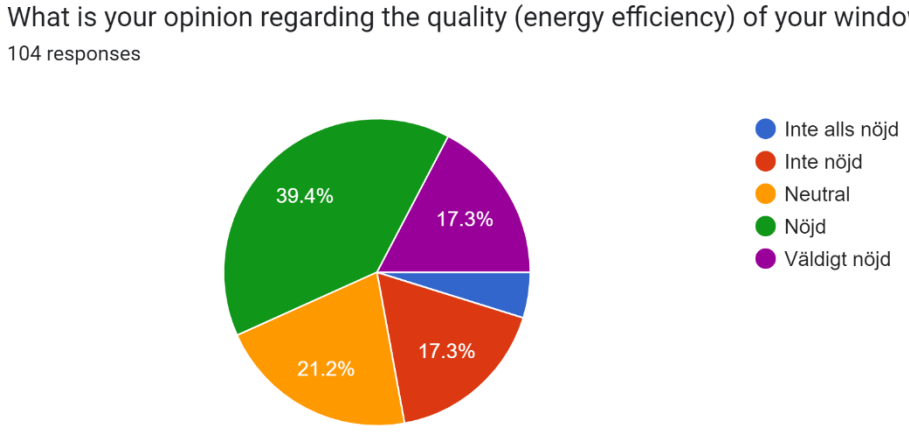
Answer: According to the survey 46,2% are satisfied with the energy efficiency of their house, 25% are neutral, 12,5% unsatisfied, 10,6% the remaining 5,7% were very unsatisfied.

Q12: What is your opinion regarding the level of energy efficiency of your devices?



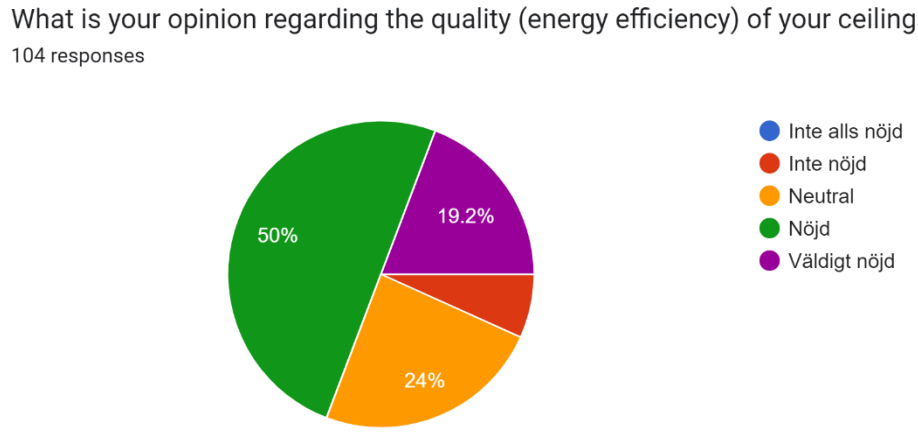
Answer: Among the respondents 46,2% are satisfied with the level of energy efficiency of their household appliances, 42,3% are neutral, 5,8% not satisfied and 5,8% are very satisfied with their energy efficiency of their household appliances.

Q13: What is your opinion regarding the quality (energy efficiency) of your windows and doors?



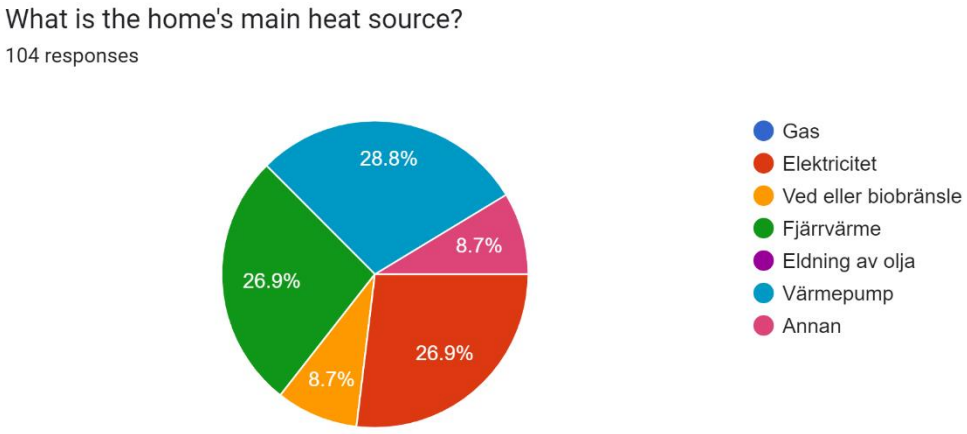
Answer: As a result, 39,4% are satisfied with the quality (energy efficiency) of their windows and doors, 21,2% are satisfied, 17,3% are very satisfied, 17,3% not satisfied and 4,8% very unsatisfied.

Q14: What is your opinion regarding the quality (energy efficiency) of your roofs and walls?



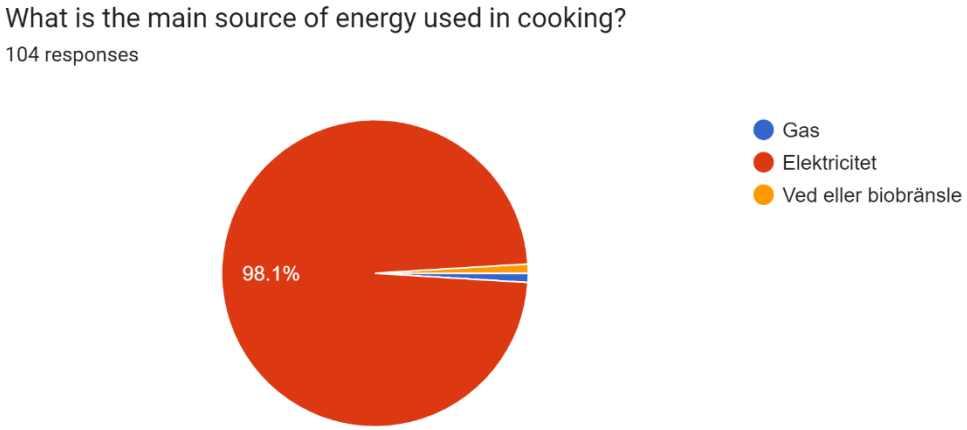
Answer: Most of the respondents (50%) answered that they are satisfied with the quality (energy efficiency) of their roofs and walls, 24% are neutral, 19,2% very satisfied and 6,7% very unsatisfied.

Q15: What is the main source of heating at your house?



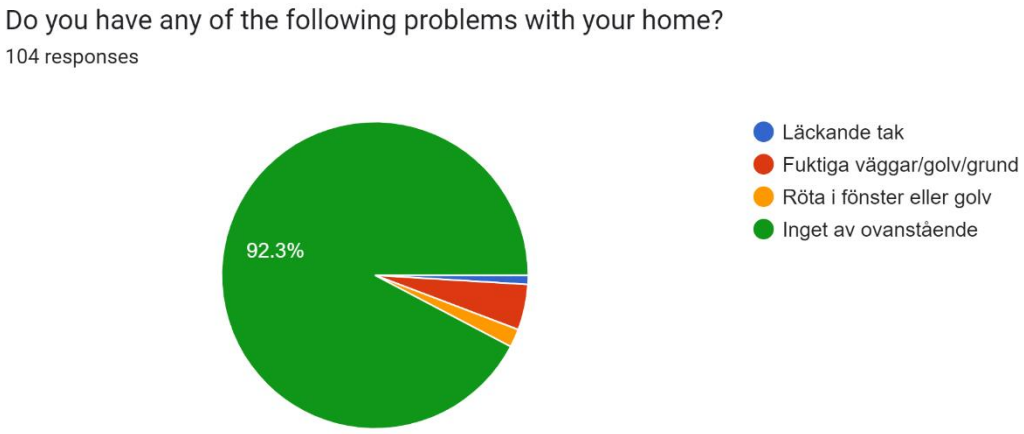
Answer: Concerning the home's main heat source 28,8% use heat pump, 26,9% use district heating, 26,9% electricity, 8,7% use wood and biofuels and 8,7% use other than the ones specified above.

Q16: What is the main source of energy used for cooking?



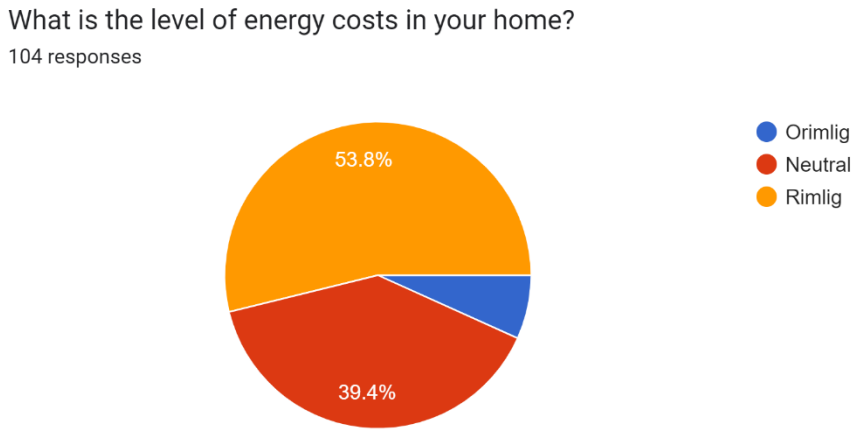
Answer: A clear majority of the respondents 98,1% use electricity for cooking, 1% used wood or bio fuels and 1% use gas.

Q17: Do you have any of the following problems with your house?



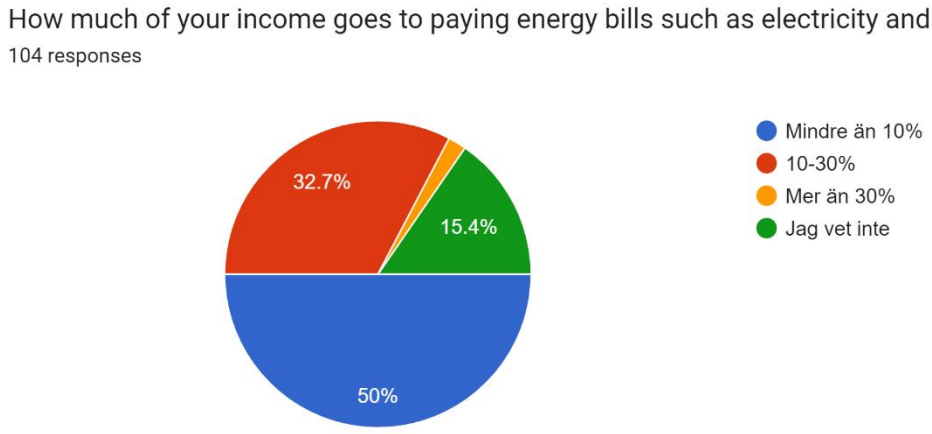
Answer: The majority of the respondents 92,3%, experience no problems with leaking roof, damp walls/floors/foundation or rot in window frames or floor, 4,8% have problems with damp walls/floors/foundations, 1,9% experience rotting in window frames or on the floor, 1% have problems with leaking roof.

Q18: How affordable is the energy cost for you?



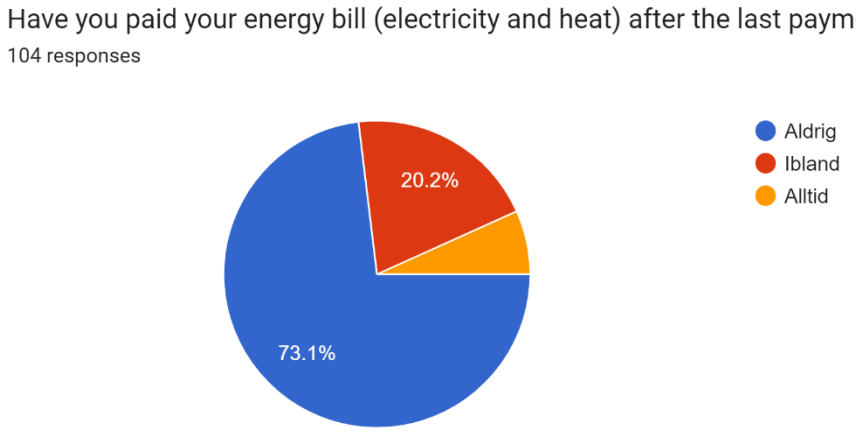
Answer: Most of the respondents (53,8%) find the energy cost at their homes affordable, 39,4% find the energy cost at their homes neutral and 6,7% find it unaffordable.

Q19: What percentage of your household's income goes for energy bill (electricity and heating)?



Answer: Most of the respondents (50%) spend less than 10% of the household income on energy bills (electricity and heating), 32,7% spend 10-30% of the household income on paying electricity bills, 15,4% do not know and 1,9% spend more than 30% of the household income on paying the energy bills.

Q20: Do you ever have delays in paying your energy bill?



Answer: 73,1% stated that they have never had delays in paying their energy bill, 20,2% are sometimes late and 6,7% are always late.