



# **Inventories of the mind-sets and needs of all relevant stakeholders in the target regions**

## **Report D3.1**

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**October 2020**



This project has received funding from the European Union's Horizon 2020 Research and innovation programme under grant agreement No 847087.

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Manuscript completed in October, 2020

This document is available on: [www.replace-project.eu](http://www.replace-project.eu)

Document title	Inventories of the mind-sets and needs of all relevant stakeholders in the target regions
Work Package	WP3
Document Type	Deliverable
Date	October 2020
Document Status	Final version (v 1.0)

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## Executive Summary

With heating and cooling (HC) comprising 50% of final European energy consumption and over 68% of all gas imports, permanently reducing consumption and increasing the share of renewables in this sector is paramount for a successful Energy Union. In particular, the fact that 80 million out of 120 million installed space heating systems in Europe currently achieve an energy label class C or D gives rise to major concern.

**REPLACE therefore aims to boost the phase-out of inefficient and old heating and cooling systems by targeting consumers, investors/owners as well as intermediaries (installers, plumbers and chimney sweepers) and helps them to make or support the making of informed decisions.**

**Purpose:** This report is related to the outcomes of the activities performed in tasks T3.1, T3.2 and T3.3 of REPLACE. In each task, T3.1 to T3.3, nine analyses related to each, end consumers, intermediaries and investors were developed, one for each of the nine target regions (the two target regions of HR were tackled as one cohesive region). The analyses aimed at finding the socio-economic motives and mind-sets of those key stakeholders and their perceptions, attitudes and interests. These analyses will support building the ground for the design of a strategy (WP 5) on how to engage the different target groups in the regional replacement campaigns (WP 6).

### Methodology:

The original idea was to develop these tasks by using a mix of two methods, namely face to face focus group meetings with six to ten representatives (Task 3.1 and 3.2) and semi-structured interviews (Tasks 3.1 to 3.3), which could be conducted in bilateral meetings, group meetings, via phone or other means.

Due to COVID-19 pandemic and the legal limits established by the project partners' governments in response to the healthy crisis, the originally planned structure for the stakeholder analysis had to be slightly adapted. In agreement with the REPLACE project advisor, it was agreed that in those countries where no face to face meetings could be developed at the time scheduled for these activities (mainly April-May 2020), interviews could be developed by web meetings, phone meetings or any other similar action which would allow similar results as the original method. Thus, the COVID-19 crisis did not significantly affect the output of WP3.

To summarize:

- The activities corresponding to T3.1 (consumers) and T3.2 (intermediaries):
  - each task builds on the results of one focus group session involving six to ten representatives, and supplementary semi-structured interviews with six to ten representatives of those target groups.
  - or, when no face to face meetings is possible, the result will build on semi-structured interviews sent to stakeholders done by phone, web meetings or email (or similar), aiming at minimum 12 stakeholders for each task.
- The activities corresponding to T3.3 (large investors, like building developers, contracting companies or district heating system operators as well as financing institutions):
  - the result will build on semi-structured interviews sent to stakeholders done by phone, web meetings or email (or similar), aiming at at least 6 stakeholders.

The focus was on heating and cooling (HC) equipment replacement issues, market conditions and observations and on related collective actions. Investors additionally were asked about heat supply models and demand response related activities.

As can be seen by the number of interviewees, this report is not based on a full-scale scientific socio-economic analysis, as the REPLACE team did not have budget to make representative surveys among

the three target groups in the nine pilot regions. While such scientific surveys often comprise hundreds or even more respondents, the nine teams had resources to interview a minimum of 30 people in each target region, at the same time targeting, at three different target groups. Therefore, the results are not 100% scientific representative but of help for the purposes of the REPLACE project.

**Key Finding and Conclusions:**

There are still like-for-like replacements in the field of oil and especially natural gas. Those end consumers made good experiences with their fossil-based heating systems, supplying them over many years reliably with heat. Furthermore, the current Covid-19 pandemic lead to a market situation with low prices for fuel oil and natural gas, currently challenging momentum towards a more climate friendly heating infrastructure in the housing sector.

Nevertheless, the interviews revealed that there is a great desire from all stakeholders in the improvement of the replacement of old heating systems by new ones that are more environmentally friendly and have a lower energy consumption. Generally, there is great awareness about the implications and impacts of the old and new heating systems; this awareness is even increasing with younger generations getting more involved. However, the evolution of the replacement of these types of systems is very slow mainly because of the large investment needed for the replacement. Some other barriers are the following: most information is found online and is not displayed in an understandable manner, the coordination between stakeholders is not enough, and lastly the governments are not helping enough with financial aid as they do in other energetic areas. Despite these barriers, households - for various reasons – are replacing some boilers. There is a general upward trend in the use of biomass boilers and heat pumps, but it is, sadly, still not enough to make a significant difference in the overall fossil fuel consumption of Europe. Most of the old heating systems are mainly being replaced by solar thermal systems, boilers for wood or pellets and heat pumps, but the high investments and the long lifetime of the current heating system for many users are keeping the replacement numbers rather low. The replacement market needs more financial support and public guidance (up to regulatory commandments and prohibitions, which are currently being implemented in some of the pilot region).

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# Introduction

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## 1.1 About the project

Half of Europe's energy consumption is used for heating or cooling. However, two thirds of the heating systems installed in Europe – that is 80 million units – are inefficient.

In order to achieve the climate targets and make Europe independent of oil, coal and natural gas, changes in this sector are essential.

The aim of REPLACE is to motivate and support people in nine different countries to replace their old heating systems with more environmentally friendly alternatives. Simple renovation measures that reduce overall energy consumption are also part of the program.

REPLACE aims to motivate and support people in nine different countries to replace their old heating systems with more environmentally friendly alternatives. To reach that goal, REPLACE project brings together installers, chimney sweeps, politicians, and other key players at one table, regionally.

## 1.2 About WP3

The activities covered by WP3: Inventories of the mind-sets and needs of all relevant stakeholders in the target regions – are focused to obtain accurate knowledge of the mind-sets and needs of all relevant stakeholders in the target regions which can then be discussed with policy makers and the LWGs (T.5.1) to optimise existing policy programmes (T.5.2) and develop the campaign action plans (T.6.1). Furthermore, to develop socio-economic and statistic input needed to implement realistic and tailor-made programmes and gender aware campaigns, while accurately taking the current status in the regions into account.

## 1.3 About T3.1/3.2/3.3

In tasks T3.1 to T3.3, mind-sets and needs analyses for three different target groups are developed for each one of the nine target regions (in total 27 regional surveys and analyses are conducted). These analyses are aimed at tackling the socio-economic motives and mind-sets of key stakeholders and their perceptions, attitudes, and interests.

These analyses, which are focused on HC equipment replacement, demand response, heat supply models and related collective actions, will support building the grounds for the design a replacement strategy and provide information on how to engage the different target groups into the regional replacement campaigns.

The analyses in T3.1 and T3.2 originally build on the results of focus group sessions involving six to ten representatives of the respective target groups (consumers and intermediaries), and complemented by semi-structured interviews with six to ten representatives of those target groups. The semi-structured interviews either can be in the form of e-mail or online questionnaires, telephone, or face-to-face interviews of target group representatives at appropriate occasions.

Due to COVID-19 and the legal limits established by the EU governments, the final decision agreed with the REPLACE project advisor was that in those countries where no face to face meetings could be developed at the time scheduled for these activities (mainly April-June 2020) they could be developed

by web meetings, phone meetings or any other similar action which allows to obtain similar results than the original. Thus, this will not affect the output of WP3.

## 1.4 Time schedule

- March 2020: Identify target groups and reserve venue(s)+ Save the Dates in April
- April-June 2020:
  - T3.1 & T3.2 focus groups, semi-structured interviews some days/weeks later
    - 2 focus groups conducted (with 6 to 10 people)
    - 6-10 semi-structured interviews per target group (for each, T3.1 & T3.2)
  - T3.3 semi-structured interviews
    - 6-10 semi-structured interviews per target group conducted
- June-July 2020: Documentation
- **ESCAN:**
  - **July-Aug 2020: Compilation of socio-economic findings (e.g. by mind-mapping)**

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## General overview of stakeholders' mind-sets and needs in partner regions

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The main focus of the report is to acknowledge the opinions and interests of the three main groups of stakeholders in the replacement of heating systems. These three groups are the consumers, the intermediaries and the investors. Bringing together the interests of these three groups it arises the logical challenge that intermediaries and investors aim is to make business while consumers wish to make the best deal, not only in monetary terms.

This report has been produced by using a common methodology to understand the stakeholder's mindsets in the partner regions, by means of requesting feedback on a common set of topics adapted to the national conditions. The feedback was aimed to be obtained by stakeholders in focus group meetings and complemented with questionnaires, but when not possible due to COVID19, they were complemented with phone meetings, or their opinions and interests were expressed through questionnaires and individual meetings.

A first conclusion found in most countries is that all consumers, from younger to older generations have showed awareness on the need to change to more efficient and renewable technologies, due to economic but also the impact of inefficient space heating forms in the environment and human health. The younger and middle age consumers showed more interest in replacing their heating systems while the older generations were more concerned about changing their habits or making any major structural changes to the facilities or homes by relying on these new heating systems.

Although, the before statement corresponds with the upward trend of renewable heating systems purchases, it is still not enough. There are several barriers for the replacement of heating systems by the consumers, as the relatively low prices for competing fossil fuels as oil and natural gas, but mainly the large investment costs and the technical difficulties to install a new heating system are outstanding. Moreover, most consumers are aware of the main benefits of the replacement such as financial savings in the medium and long run and the environmental benefits, but they are not feeling confident enough to make the change.

Regarding intermediaries' group, they show a great interest in additional information and training. They believe it is important to highlight that there is a need for a quality knowledge centre on an online platform that will cover all aspects of heating and cooling systems and give consumers reasonable and independent information regarding technical solutions. An oil boiler is usually only exchanged for the following reasons: if it breaks down, if it has not a reliable operation, because of increasing malfunction, it is not secure anymore, or if the license to operate the fuel oil tank runs out. Also, in some regions, their perception is that a large part of consumers feel it is not easy to get several offers from installers to compare prices – as in some regions there are too few of them available on the market. Installers confirm the preference of pellets as a replacement of old heating systems, but they point out the lack of finance and discrepancy between expectations and results.

Project promoters and investors mainly think that renewable energy systems for heating should be supported by the government through appropriate regulations regarding energy distribution, urban planning by heating type, review processes of construction permission approval and requirements for new buildings. As well as installers, investors are currently highly interested in solar thermal systems, systems based on biomass (wood, pellets and wood chips) and heat pumps. For this stakeholder group, an important barrier for the installation of renewable energy systems is financing.

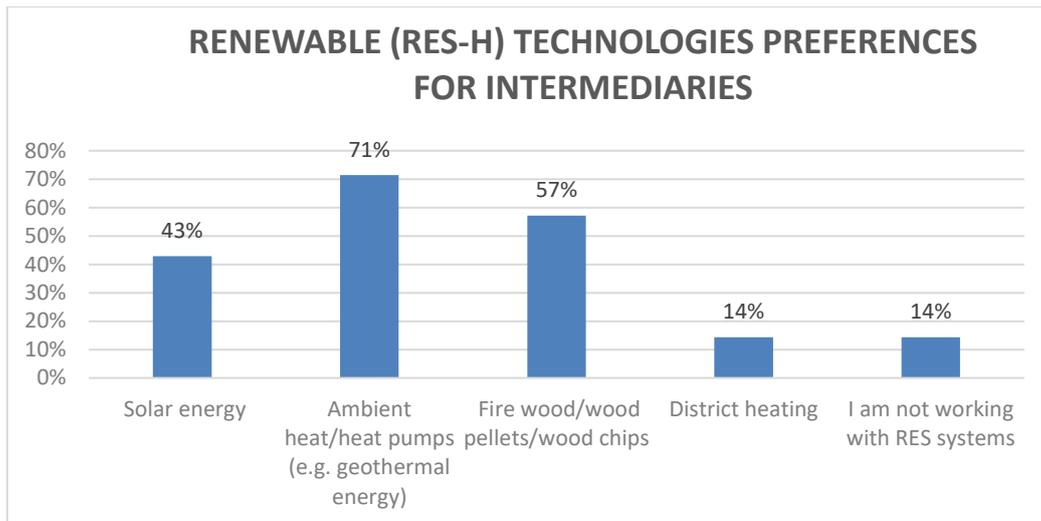


Figure 1: Renewable heating (RES-H) technologies interviewed intermediaries are working with (Bosnia and Herzegovina)

Installers and investors find that there are not many cooperation mechanisms, many do not have their own association and they do not have communication with the local administration. They also point out that without subsidies and other financial support models, it will not be possible to achieve significant results in replacement activities. In fact, the study shows that the main obstacle to the installation and use of renewable energy systems is their high investment costs and difficulties to finance it by end users. Below, there is a figure as an example of the main barriers for the replacement of heating systems in one of the target regions.

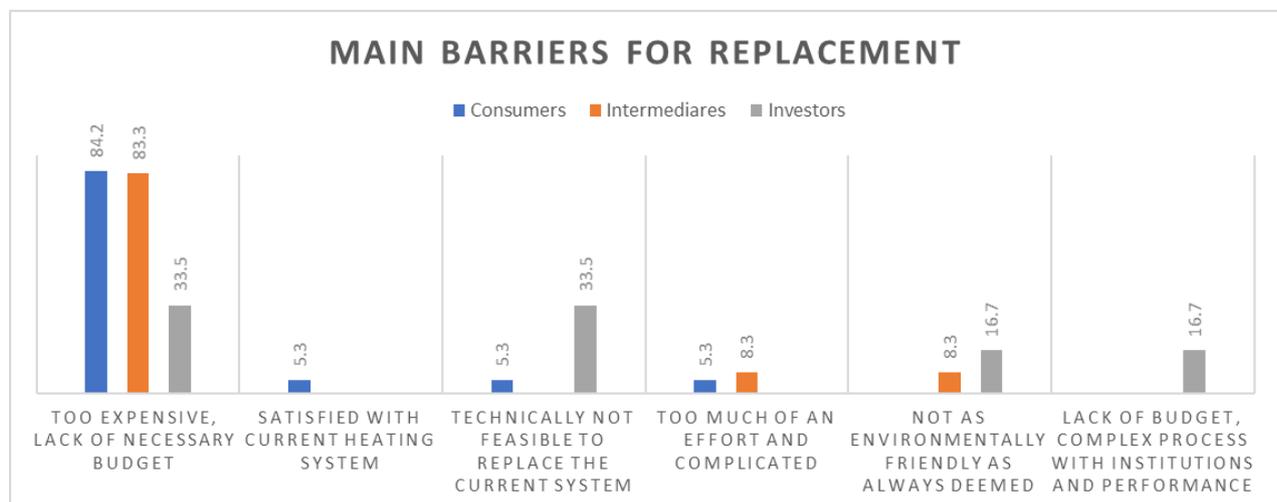


Figure 2. Example of main barriers for replacement for one of the target regions (North Macedonia)

Information sources used by most of the study participants - in all three stakeholder's groups - to search for renewable systems and other relevant data are online sources, professional literature, educational workshops and conferences organised by relevant institutions, in that order. What all three stakeholders agree on is that the financing of heating system replacement should be supported through certain financial instruments and would be benefitted by a simplified administrative process.

It is also mentioned that systems that cover both heating and cooling will be increasingly represented because of climate change and the raise of temperatures, even more in summer.

A great desire to improve knowledge in the field of renewable energy systems was recognized among the respondents of all three target groups. Conducting campaigns, establishing an online platform for exchanging experiences and information and calculation tools would greatly help in promoting and developing awareness of the importance and benefits of renewable energy systems.

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## Country-region Analyses

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### 1.5 Austria – Land Salzburg

In Austrian's pilot region, the State of Salzburg, REPLACE aims to help residents and owners of family up to large volume buildings to switch old heating oil and inefficient all-purpose boilers utilized for individual centralized heating for modern, comfortable heating systems based on renewable heating systems including district and micro grids. Salzburg aims to decarbonize its electricity supply by 2030 (referring to the environmental impact of heat pumps) and its district heating supply by 2040. Room conditioning with individual ovens (coal, coke, oil, wood) no longer exists (except for modern tilt stoves as a secondary heating system).

REPLACE helps to ease the fuel switch towards renewable for both sides, namely the end consumers and investors that are demanding a fuel switch and the intermediaries (installers, energy advisors, chimney sweeps, heating system manufacturers, banks etc.) that are needed to supply adequate services for the ones that need those to implement decarbonisation technologies on the residential space heating market.

The 30 interviews with end consumers, intermediaries, and investors summarized in the section of Austria will help to understand the mind-sets, needs, barriers and challenges these three groups are facing in the current economic environment.

#### 1.5.1 Main Conclusions

Oil-fired boilers are generally robust, durable appliances that can achieve a long service life of over 30 years with the help of minor repairs. Therefore, the majority of mostly older owners of oil boilers, typically living in one and two-family houses, prefer to operate the existing system as long as possible. An oil boiler is usually only exchanged for the following reasons: (a) if it breaks down, (b) if a reliable operation, because of increasing malfunction, is not secure any more, or (c) if the license to operate the fuel oil tank runs out. When one does not consider all other negative side effects, like-for-like replacements are still a low investment and low involvement solution.

Nevertheless, as for federal and state energy strategies, people are already aware that burning oil for heating has a definite end date. The Austrian federal government wants to phase-out fuel oil from 2025 onwards in a step-by step manner by 2035. National and provincial authorities are increasingly supporting the switch for renewables, as households can avoid two to three times the amount of greenhouse gases with a lower investment than with an electric car, for example. In the province of Salzburg, half of the 50,000 households still heating with fuel oil shall switch to renewables and district heat by 2030. The province undertakes about 3,000 energy consultations per year, only part of which are oil boiler replacement consultations. However, an annual number of 2,500 boiler replacements would be needed to achieve the planned decarbonisation path. The situation is quite similar in other Austrian provinces as well. Therefore, in 2020 substantial federal and especially provincial public funds have been allocated to reduce the higher up-front costs of cleaner, more environmentally friendly solutions. In Salzburg, a typical support currently adds up to >30% of total investment of a fuel switch for renewable heating systems for single-family houses.

Furthermore, the province of Salzburg will be the first in Austria to ban oil from existing buildings. In the event the old boiler needs to be replaced, only renewable or district heating systems will be an

option, starting from 1 January 2021. This is quite ambitious, and it has to be ensured that households are not challenged too much. Private households in particular often do not have the necessary funds to invest in the switch to climate-friendly heating systems or in thermal building refurbishment. Conversely, the default risk is too high for contractors who would in principle be prepared to take on the investments in this segment to make the investments in this segment. Against this background, a state fund with a liability framework of 50 million euros (present value) is planned to be set up. It is expected that new entrepreneurs (e.g. installers) offer contracting for such low-income households.

There are also other challenges that need adequate mitigation measures. Switching to climate-friendly solutions for all households requires a lot of information, time, coordination, and money (20 to 30 thousand EUR, without financial support). A lot of house owners do not have the necessary time, are overwhelmed by the complex subsidy schemes, are insecure because of stop-and-go public funding and insecurity of height of final funding; cannot afford a replacement, are not eligible for a loan (e.g. because of advanced age) or have other preferences for money saved (no interest in anticipatory action). Moreover, many households shy away from a typically five-day construction site with many different artisans to coordinate. On top of that it frequently is not easy to get several offers from installers to compare prices, as there are too few available on the market. While the quality of the work of independent public advisors and installers is quite high, installers frequently do not ensure an efficient operation of systems after the boiler was replaced (i.e. hydraulic balancing, system alignment etc.), which would otherwise allow for a full exploitation of cost savings.

To solve the problem of like-for-like replacements at emergency situations, interviewees suggested support for mobile heating devices that can bridge over a break-down of a boiler. This would allow households to take informed decisions and to have the time required for a fuel shift. Mobile heating containers could also help to add another 15-20% of boiler replacements of a normal year by enabling replacements in the second half of the heating season, where demand normally is lower. Regarding funding, administrative burdens should be reduced. An important one, namely the stop-and-go funding of the federal fuel-switch support, is planned to be bridged over by funds of the province of Salzburg.

There is confidence that the Local Working Group (LWG) of REPLACE in the province of Salzburg, in charge of elaborating a replacement campaign for 2021-2022, could bring about all-around carefree packages to tackle a lot of the other challenges that also need adequate mitigation measures. Barriers include the need for information on technology choices, support system related challenges, the administrative burden as well as the complexity of implementation – many artisans are necessary and need to be coordinated – and support regarding affordability and financing. Potential providers of all-around carefree packages could be installers, boiler manufacturers or a group of artisans active in that business. There are already a number of initiatives from companies that are going in this direction. The LWG is going to define what a standardized, recognizable package could be made up of and what criteria and quality issues could be helpful to build confidence at consumer side in such a new offer.

## **1.5.2 Mindsets and Interests of Consumers**

In the pilot region of the State of Salzburg, the five districts of Salzburg have truly diverse socio-economic and structural local end consumer situations. Due to limited resources for end consumer interviews, which did not allow interviewing sufficient high number to gain valid results for each district, fifteen public independent energy advisors active in those districts were interviewed regarding both perspectives, namely from an end consumer perspective and from their own view.

As end consumers approaching independent energy advisors are a group of end consumers that already are interested in a fuel switch, they are not representative for all end consumers that own a heating oil or all-purpose boiler. Some of the interviewed installers think that (even if their boilers are older than 25 years), end consumers would not take initiative before the boiler breaks down. It is estimated that only about 20 % of end consumers are actively thinking about a fuel switch towards renewables, even in a current environment where the switch because of subsidies costs only 15 kEUR instead of 25 kEUR (see next table).

**Table 1:** Investment grants for a replacement of a fossil fueled heating system for one- and two-family houses (precondition for the federal grant is a refurbishment of the building shell).

Eligible Measure	Grant from State of Salzburg	Additional oil out bonus from Salzburg	Federal Grant	Total Grant
Log wood	2,000	2,020	5,000	9,020
Wood pellets	3,000	2,020	5,000	10,020
Wood chips	4,500	2,020	5,000	11,520
Air heat pump	0	2,020	5,000	7,020
Other heat pumps	3,000	2,020	5,000	10,020
Connection to biomass district or waste heat	3,000	2,020	5,000	10,020
Connection to district heat in the city Salzburg	2,000	2,020	5,000	9,020

Source: State of Salzburg

The other 80 % have in general had a good experience with their fuel oil boilers. Often those boilers operate up to 30 years and sometimes even more without severe problems.

The following figure shows that about one third of the oil boilers that provide heat for about 40,000 households in Salzburg are older than 20 years (a part of them is even older than 35 years).

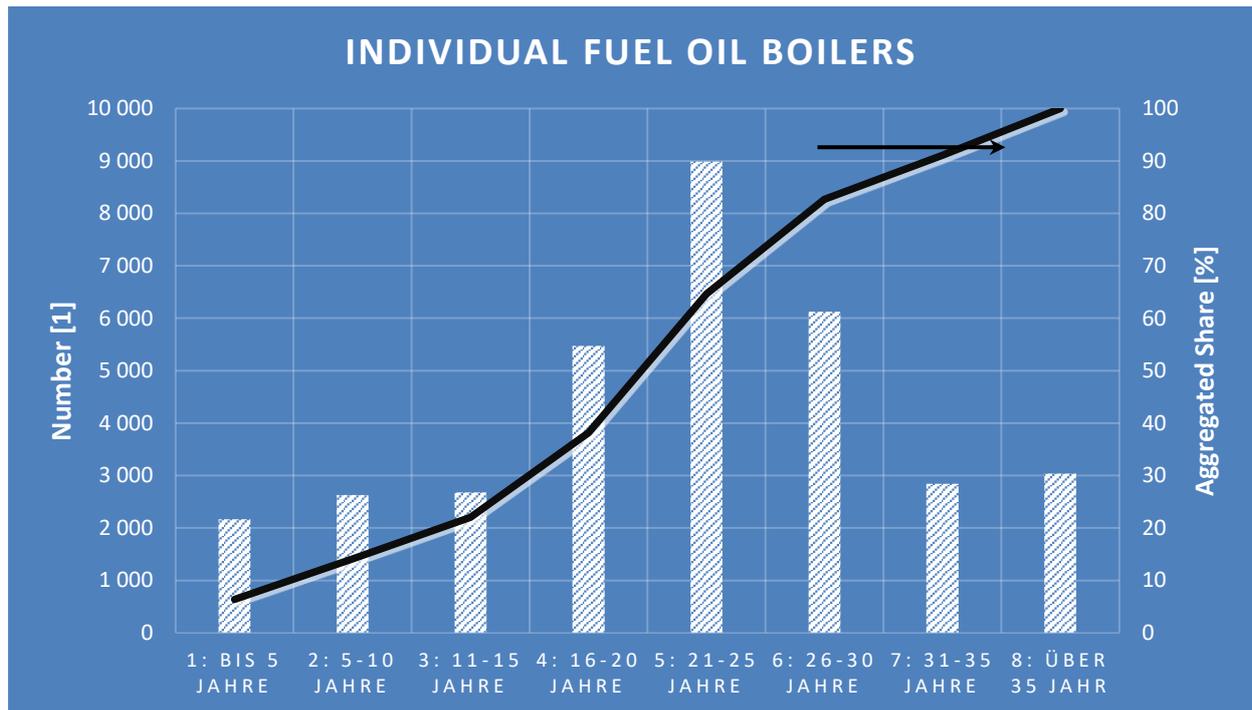


Figure 3. Individual fuel oil boilers (Austria)

Source: State of Salzburg

In conclusion, the following text reflects those 20 % that currently even think about a fuel switch. Nevertheless, there are findings that are of general nature, i.e. that are also true for those end consumers that are rather reluctant regarding considering a fuel switch for renewable heating systems in the next years.

### 1.5.2.1 Overview

The majority of households running old oil boilers is in general not aware of the benefits new climate-friendly systems can bring them. Most of these households have had good experiences with their existing systems regarding reliability, life-time expectation and, as of recently, fuel costs. Heating is not a topic that consumers actively search for information about as long as the system works. Furthermore, information about RE-based systems normally does not reach them and as such are not aware that RE-based systems today are of equal quality regarding comfort, reliability, life-time expectation, and noise etc. Furthermore, contrary to fuel oil boilers, they are climate-friendly and contribute to the functioning of regional structures as the money for both, the investment and the running costs (especially fuel) does not go abroad, but remains mostly in the region, thus helping to secure jobs and livelihood.

In case the old oil boiler starts having problems people start to search for information, either on the internet, by asking friends, relatives, or neighbors, attending trade fairs or contacting their installers. Many are not aware that there is network of 40 independent energy advisors in Salzburg. Their services are free-of-cost, even if they visit the household twice for consultations. Those energy advisors are well trained and have good skills and tools at hand. They investigate the entire home and can recommend, besides measures to reduce energy consumption by thermal insulation, the most appropriate one or two RE-based systems or district heat, if available. Furthermore, households have the opportunity to learn about the benefits of the recommended systems (for the climate and the

region) and how high the investment would be, if subsidies are deducted and at what height the annual energy cost savings can be expected, i.e. in what time the net up-front investment can be expected to pay off.

Politicians meanwhile recognized the benefits and necessity to phase out fuel oil on the heat market. This is important as people are more confident in doing something right, i.e. “something that my children, future generations, the region, the environment, the climate, and the whole society will benefit from”. In general, younger people are well aware of this, older people (those is the majority of the group running fuel oil boilers) have in mind that the oil fired system works well and are not always thinking outside the box as much as the younger generation. However, despite this drive to do something good, there are a number of barriers that prevent households from doing so.

Switching to climate-friendly solutions for typical households requires a lot of information, time, coordination, and money to spend (20 to 30 kEUR, without financial support). A lot of house owners do not have the necessary time, are overwhelmed by the complex subsidy schemes, are insecure because of stop-and-go public funding and insecurity of height of final funding; cannot afford a replacement, are not eligible for a loan (e.g. because of advanced age) or have other preferences for money saved (no interest in anticipatory action). Moreover, many households shy away from a typically five-day construction site with many different artisans to coordinate. On top of these challenges, it is frequently not easy to get several offers from installers to compare prices, as there are too few available on the market. While the quality of the work of independent public advisors and installers is quite high, installers frequently do not ensure an efficient operation of systems after the boiler was replaced (i.e. hydraulic balancing, system alignment etc.), allowing for a full exploitation of cost savings.

There are also challenges related to the RE-based systems preferred by households, especially air/water heat pumps, which – because of moderate up-front investment – increasingly dominate the boiler replacement market: End consumers frequently have the fixed idea to go for air heat pumps, although the energy adviser (and even the installer) did not or would not recommend it as the first choices. Some cases have been reported where air/water heat pumps were installed in houses, but where the quality of the building shell or/and the heat distribution system/temperature did not fit that technology. The end results are often exorbitant electricity costs, especially in cold winters, which are very common in the mountainous Salzburg regions. Those households are then forced to refurbish the house or/and re-build the in-house heat distribution system – which entails investments they never had initially planned to spend.

### **1.5.2.2 General Benefits, Barriers, Concerns and Expectations**

#### **Main Benefits to Switch to a Re-Based System**

End consumers are not only often unaware about the effective (net) up-front costs (deducted for investment subsidies), but also about the annual cost savings (or a combination of both, the typical payback time) of a fuel switch for renewable energy heating systems. Fuel oil utilization is commonly perceived as reliable and comfortable, especially if environmental and purchasing power loss issues are not realized or matter less. In general, younger people tend to be more environmental conscious than older ones.

Positive connotations are: I am doing something right – as it is supported by the public hand, I am doing something that my children, the region, the environment, the climate, and the whole society. Some percent of society or a relevant share of first movers are technology-affine people that are well informed and aware of the benefits that renewable energy heating systems bring: more comfort,

energy efficiency, and heat supply reliance. Furthermore, such systems tend to be more resilient regarding fuel cost fluctuations as renewable energy sources normally are both cheaper and of a lower share related to full costs (CAPEX and OPEX). Another benefit is that some people would like to hand over a working home to the next generation or are aware that their premises worth increases with an “already 2050 fit” heating system.

In the field of all-purpose boilers (that are currently primarily used to burn log wood), there are people that are in an age where they prefer more comfortable solutions like wood pellet boilers. This trend is true even for farmers’ households as many of them in Salzburg are part-time farmers and they have limited time and resources (i.e. lack of expensive equipment) to go into a forest and to make their own log wood. In some cases, where RE-based systems require storage (like for wood pellets and log wood) limited or no available space in the house or the wish to increase living space after boiler replacement can also be barriers. Regarding lack of space end consumers often are not aware of options like external pellets storages that can be placed under a car parking slot for example, that are however solutions that require some additional investment.

In the past, fuel oil price increases showed a strong effect on the boiler market in terms of fossil fuel boilers switched out for renewable energy heating systems. Over the past couple of years, the situation has changed, however, as fossil fuel prices stayed low or recently declined even more. In 2020, during the COVID-19 crisis, WTI prices became negative for the first time in history, and many individuals filled up their storage tanks with cheap fuel oil. As a result, a further heating season is often lost for boiler replacements as fuel storages were filled up beforehand.

Nevertheless, many people currently perform and plan a fuel switch for a RES heating system: a relevant share of society is aware of both high subsidies for and governmental plans to phase-out fuel oil in the next two decades. Among them are the people that consult public and independent energy advisors.<sup>1</sup> There are people that doubt whether such high subsidies will be available in times of COVID-19 stressed public budgets in the future and thus want to capitalize on the opportunity while they still can.

High subsidies currently bring the boiler market – not so much the boiler supply but rather the installers’ capacities – to its limits. Unfortunately, the high subsidies also entail deadweight effects (people benefit that could have afforded a replacement anyway), price increase effects (some installers increase their prices, i.e. despite the work load, if I can guarantee that I will get it done, at least I will get paid handsomely for it), and market shortage effects. In the latter case, end consumers often get only one or two instead of the wanted three or more offers to compare pricing and service packages.

### **Main Barriers for Replacement**

In general, the availability and quality of technical systems and solutions tend not to be a barrier for a decarbonization of the residential space heating market. There is a wide variety of technologies, which exist in sufficient quantity, quality, efficiency, and reliability.

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<sup>1</sup> There are 40 of them in the State of Salzburg that perform about 3,000 consultations per year (regarding building shell, heating system or other energy efficiency measures).

Many end consumers shy away from a non 1:1 replacement, i.e. especially from a fuel switch for renewable energy heating systems because of higher complexity, additional information effort and added costs. In addition, many are not happy with the outlook of longer construction times, i.e. five working days instead of 1-2 for a like-for-like renewal, or of having to live in a construction site, where dust and noise is common, and where strangers constantly enter and exit the property. The latter aspect has become even more relevant due to COVID-19 aspects. For residents living in multi-story residential buildings, the legal conditions make it very difficult to realize a fuel switch for RES heating systems, because usually an absolute majority of pro-voters, actually being present at the vote, is needed to make a change.

One aspect that prevents many people from taking action is that many separate aspects of the renovation have to be organized and scheduled, if it is not done by one of the craftsman listed here (tentative list), which is not often the case:

- Disposer, for clearing out the cellar
- Disposer, removing the oil boiler and oil tank and disposing the equipment & fuel oil
- Master builder for new construction/conversion of the biomass storage room
- Chimney renovator (and possibly roofer, plumber)
- Chimney sweeper
- Shipper of the new heating system
- Installer for the installation of the new heating system
- Electrician
- Shipper of the new fuel (if required)
- Service technician of the manufacturer
- Pipe Insulator
- Floor layer
- etc.

Many people, especially off-liners or older people, are overwhelmed with the funding process, which happens online and is rather complicated; furthermore, incentive schemes are frequently updated, which makes it very difficult for end consumers to have some planning security. The timeline (i.e. point of exhaustion, greyhound principle) and the availability of funds offered at the federal level are difficult to predict. In many cases, the decision to actually undertake a complete renovation takes so long that the funding options change; additional information about new support offers can help to get people to switch their systems more easily. Furthermore, the State of Salzburg's funding schemes are also rather complicated as they can stem from two different sources: the housing subsidy scheme or the energy subsidy scheme, operated by two different State departments. In the framework of the housing subsidy scheme, obligatory periods for comprehensive refurbishments are set. If a boiler replacement is made in parallel, projects may experience realization difficulties because of tight timelines. The stop-and-go nature of federal funds is planned to be bridged-over by State funds in near future, which would increase planning security for business and end consumers.

The even more challenging aspects that probably hinder people to consider a fuel switch for RES heating systems are affordability and financing issues. Households that are looking for a new suitable and alternative heating system for their house are most concerned with up-front costs deducted for investment subsidies: this is often the most decisive criteria for going forward with the change. This issue becomes even more topical as the State of Salzburg plans a commandment or even an obligation for renewable energy heating systems – in case of failure of an old oil boiler in an existing building, starting with 1 January 2021. There will be some exemptions, but there will be a number challenges especially for groups faced with affordability / financial issues. Among those groups are individuals that are confronted with, e.g.

- Income-related limitations, i.e. low household income, mainly needed for daily life
- No (sufficient) access to debt financing, i.e. households that e.g. due to age of persons (often starting with 65 years) or limited loan guarantee in terms of income, fixed assets or non-availability of relatives that could take over liabilities.
- Age-related hardship cases, i.e. elder people that plan to or already applied for a place in a retirement or nursing home or if the house is planned to be refurbished or even deconstructed in near future. As a result, older generations often wait for younger relatives, who will take over the house, to make the necessary heating system changes.

For those cases, appropriate solutions must be offered by the federal and state government as well as by the private sector. The provincial government sees no solution in granting higher subsidy rates to lower-income households. In general loan financing would be possible mainly for younger people, while older generations would need to assume liability. The public sector would have to assume liability in order to give affected groups access to outside capital. Clear regulations for the liability framework<sup>2</sup> are needed.

### 1.5.2.3 Attitudes, Channels and Preferences

#### Negative and Positive Aspects of Heating for the Consumer

The heating system installed in one's house is rarely noticed by the majority of people. During most of the year, they are simply unaware about the boiler in the cellar. The heating system in general "just" has to work. However, in areas with colder climates – like the State of Salzburg – the heating system is a vital and crucial part of a safe and comfortable home. If a malfunction happens in the winter (heating) season, the system is perceived to be a large nuisance. In most cases, only simple problems with the burner or the steering unit occur (sometimes people change unknowingly change settings thereby disrupting normal system operation).

As land is limited in State of Salzburg and housing plot prices are high, there is a trend to realize more and more multi-generation houses. That means that the next generation extends the existing house of the earlier generation. As a result, the heat load for the heating system increases, if the thermal quality of the shell of the existing house and of the extension is not adequately improved. This is however a good window of opportunity to improve the energy efficiency and the carbon footprint of the whole building.

Elderly relatives living in such a house are sometimes willing to assist the younger generation, while in some cases they are of the opinion "Let the next generation do (and pay) it". There are lots of different, sometimes conflicting, views about the common heating system that is deemed most suitable. While older people tend to prefer heating systems where something is burned (i.e. pellets), the younger

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<sup>2</sup> A solution (at least) for financially weak persons is imminent, however: Within the framework of environmental promotion in Austria, the Ministry for Climate Protection (BMK) is planning a fund (net present value) of EUR 50 million for the assumption of liability by the federal government for contracting projects involving boiler replacements and/or thermal refurbishment of buildings in which low-income households are located. Issues of the settlement (agency) must also be regulated by law. This package is to be finalized in 2020.

generation prefer heat pumps. Often those who cover the majority of the costs make the final decision (in many cases the younger generation). A number of people still refuse to switch to renewable energy-based heating systems, because they are climate sceptics, or they do not believe that such systems bring benefits. This consumer group will be the hardest to convince to make the switch.

### **Information Sources and Channels**

Consumers tend to rely on a limited number of information sources in order to make their decisions. The most common sources are independent energy advisors, friends / neighbors / relatives, and installers, especially when they have a long-standing relationship with these individuals. A number of consumers also mentioned that they receive initial information at trade fairs. However, many consumers end up with a number of different opinions and are thus more confused than before. Energy consultants and installers should try to deliver the same message, namely that the switch to renewable energy-based heating systems needs to happen now rather than later, in order to being able to live in a save, friendly environment also for the generations to come. Better coordination between energy advisors, installers and manufacturers would be desirable.

### **Experiences with Installers and Maintenance Service Providers**

According to public advisors, consumers have had mixed experiences with installers and maintenance service providers depending on the region that they live in. However, in general, it can be said that installers (despite of COVID-19 crisis) are rather over booked and rarely have enough time to conduct through checks after the initial installation- Hydraulic balancing and an adjustment of the heating curve and circulation pump is rarely done properly or regarding hydraulic balancing offered in the first case. On the one hand, hydraulic balancing can be a difficult task if an installer is not experienced in that field and it takes several hours up to a day and therefore is costly. On the other hand, end consumers are not aware of the benefits of an appropriate hydraulic balancing and installers do not tell about the benefits as they can earn more with tasks, they need less experience or less skilled personnel for. The adjustment of the heating curve and those of the circulation pump in some cases is done by manufacturers' staff, as this often requires special skills and the usage of laptops. Heating pipes sometimes are insulated not by the installer anymore but by specialized companies. In some cases, end consumers do not take care for insulating those pipes after the installers work was finished. Therefore, the implementation of a boiler replacement often is not performed as professional and complete as desirable, to exploit the full energy and cost savings a modern and new system potentially offers.

There is permanently an overall lack of blue-collar workers and the number of skilled workers remains more or less constant across the regions. Many companies in the regions have been searching for apprentices for years, but are having a very difficult time in acquiring the persons required, since young adults prefer (and often their parents advise them) to enter occupations that are white colour. One option would be to increase their rate per hour, but this is often difficult since customers are unwilling to pay more for such services. As a result of the limited staff, installers rarely have time to inform themselves about further or the latest technology options and thus tend to implement those technologies and concepts they are traditional familiar with and often cannot cope with innovative or more complex (e.g. hybrid) systems (e.g. including solar thermal). An urgent necessity is that the government increases the image of blue-collar jobs, as there seems to be a general lack of crafts staff in several sectors (heating & PV systems etc.) of Austria's Energiewende that according to governmental plans shall be accomplished by 2040.

Energy advisors are often asked to recommend installers but must remain neutral and independent as part of their work. Overall, many customers mentioned that they had better experiences with smaller installation companies situated in the region, because the service was more tailored and customer-oriented, or with installers they have worked together with for many years. Customers who have had

bad experiences with installers mention that these individuals often do not recommend the best option for the space, but rather try to recommend solutions that would result in a good profit. Sometimes such installers come from outside Salzburg.

Nevertheless, there are cases where end consumers have the fixed idea to go for one specific technology, although the energy adviser (and even the installer) did not or would not recommend it. This brings some installers in a dilemma, as she/he wants to make business and does not want to contradict her/his customers. Some cases have been reported where air/water heat pumps were installed in houses, where the quality of the building shell or/and the heat distribution system/temperature did not fit that technology. The result frequently is that the electricity bill exponentially increases, especially in cold winters. The household then is under pressure to find a solution and consults an energy advisor. Those households are then forced to refurbish the house or/and re-build the in-house heat distribution system – which entails investments they never had initially planned to spend.

### **Need for (more) Independent Information and Service Packages**

Independent advice is especially important for consumers, since manufacturers and installers sometime provide biased advice and offers that are not always the appropriate solution. Though free energy advice and counselling is offered in the State of Salzburg, this service is under-utilized with regard to the targets the State set itself to decarbonize the residential heat market. The province undertakes about 3,000 energy consultations per year, only part of which are oil boiler replacement consultations. However, an annual number of 2,500 boiler replacements would be needed to achieve the decarbonisation path. Furthermore, some energy advisors mentioned that they are not actually compensated for their work, since they receive a flat rate and are not paid by the hour. Their service should be rewarded more extensively, so that more time can be invested in each consultation round, since renovation decisions cannot be made in just two sessions.

In many cases, brochures with outdated information on subsidies are still in circulation, which makes it difficult for consumers to make informed decisions. Though energy advisors often inform consumers about the different subsidy sources and possibilities, the consumers tend to be completely overwhelmed by the complexity of that system. One option would be to designate a couple of people, who help consumers apply for subsidies and process the applications. The application for funding, necessary time for processing and related guidelines should be simplified, so that more time and energy could be put in finding and installing the optimal system for the household. In Salzburg, the housing subsidy and energy active subsidy (individual support for boiler replacement) conflict with one another and also set different time frames for completion of projects. Boiler replacements in the framework of the housing subsidies due to recent implementation time stipulations in many cases have a limited time frame to be realized in time. Furthermore, housing subsidies are only paid out after the comprehensive undergone renovation has been completed and the height of final subsidy is not known nor guaranteed when the decision has to be made. It would be encouraging for customers to see in advance how much funding they will receive in the end and to get guaranteed realistic implementation time frames. Currently, the number of online processes one must complete in order to be eligible for a subsidy present a lot of challenges, especially for older people. Often funding schemes also require different documentation proof and have varying forms.

As mentioned above, affordability and availability of financing options are critical elements in allowing people to switch to renewable energy-based heating systems, especially for low-income households or people that cannot receive loans because of their age.

All-round carefree package would be of great help to consumers, since they rarely have time for the extensive planning and coordination needed for boiler renovation projects. In general, all-round carefree packages are meant to be designed to address key barriers faced by households switching

from oil to renewable energy sources. These barriers include the need for information on technology choices, the support system and decision-making, the complexity of implementation (i.e. many trades are necessary and may need to coordinate themselves), affordability and financing.

In general, providers of all-round carefree packages could be installers, boiler manufacturers or a group of artisans being active in that business. The interviews revealed that a “one-stop-shop” made up by manufacturers might be interesting for end consumers that do not have contacts to local artisans on a “be known to each other” basis, which is often the case in more densely populated areas. Installers have enough work as it is and some of them thus rarely take care of project elements beyond simple installation. However, some consumers definitely trust installers more than manufacturers who may be located extremely far away and with whom there is no real contact. In this regard, it might be easier to have a central contact person linked to the local installers. This option is especially preferred at rural areas, where people know each other, and long-term stable relations are an important aspect of economic activities. A third option that was revealed during interviews is a group of artisans that run a common office including common employees that do the staff and material planning, prepare offers and perform customer services and billing. Such an office exists in the city of Tamsweg (see [www.hand-in-hand-werker.at](http://www.hand-in-hand-werker.at)). End consumers there get all offers/artisans required for a boiler replacement and/or a thermal renovation of the building shell via one contact point and for an all-inclusive price as by a general contractor.

Many interviewees liked the idea that those three options of one-stop-shops could be established and disseminated to offer their services to end consumers, while the State of Salzburg should define what minimum criteria such shops should fulfil to be eligible for an optional financial assistance and to become officially listed as one-stop-shops. Ideally, solutions regarding affordability and financing challenges as well as financial assistance related services should be offered by one-stop-shop units as well. Ideally, all those involved in such packages (energy consultants, plumbers, sweepers and manufacturers, etc.) should develop a common solution for a given household and speak a common language. More details were discussed with the next group of interviewees.

### 1.5.3 Mindsets and Interests of Intermediaries

For this section another nine intermediaries active in the State of Salzburg were interviewed (two leading members of the installers guild, three managers of federal climate and energy regions situated in Salzburg, an employee of e5 Salzburg<sup>3</sup> and of the Salzburg chamber of labour, a provider of mobile heating containers and a leading member of Salzburg’s quality network for heat pumps). Furthermore, some results of the aforementioned interviews with fifteen of 40 Salzburg’s independent public energy advisors were stated here as well. The two chimney sweepers (both members of the guild) contacted, showed no interest to participate in interviews for Replace.

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<sup>3</sup> The e5 program encourages Austrian municipalities to act in a sustainable manner at all levels when dealing with energy, consumption, mobility and the economy (find more information at [www.e5-gemeinden.at](http://www.e5-gemeinden.at)).

### 1.5.3.1 Overview

Public financed energy advisors play a critical role in providing consumers with independent and free energy advice. However, many end-consumers remain quite unaware of this service or tend to trust their installer's opinion more due to a long-standing relationship. The local government needs to expand their communication activities in order to reach households in all income brackets.

There is a lack of personnel in the executing trades linked to boiler replacement, which makes it very difficult to stick to the schedule set out by the local government. Salzburg currently registers about 3,000 energy consultations a year, only part of which are oil boiler replacement consultations, but it would need about 2,500 boiler replacements a year for achieving the energy policy and GHG reduction goals. There is a large disconnect between the building renovation schedule and the installation of a suitable RE-based heating system because of subsidy stipulations in case of an eligible comprehensive building renovation.

Overall, a number of boiler replacements are taking place, but these are often linked directly to urgent replacements due to technical defects. The active rate of replacement remains very low, especially in houses with older residents. Furthermore, many consumers are unaware of the fact that certain modern and increasing popular RE-technologies, especially air heat pumps, can only be installed, if the existing house has undergone a renovation and that also the heat distribution system can be operated below 40 °C inlet temperature. If this is not done, consumers end up with very high electricity bills, which makes them unhappy with their choice and forces them to renovate the building shell of the property.

Most intermediaries welcomed the idea of an all-around carefree package that would be developed together by the public administration in cooperation with all relevant artisans and technology providers, since it would lessen the burden for all participating parties. However, some intermediaries expressed their concern about the viability of such a package solution for all available technologies, since heat pumps, for example, are already very popular and there is no need for additional marketing, some end-consumers want to take matters into her/his own hands or intermediaries fear that they might come under pressure with their existing business model due to more over-regional competition. Such one-stop-shop packages, on the supply side must be attractive for the installers, artisans, and manufacturers (and other stakeholders, e.g. chimney sweepers) alike.

### 1.5.3.2 Fields of Interest and General Perception of Consumer Mindset

#### Common RES-H Systems

In general, most installers focus on offering services related to renewable energies. Overall heat pumps are increasingly dominating the boiler replacement market. The main added value Austrian installers generally generate is in the bathroom, sanitary and water installations field. This is also why it is challenging to increase the boiler exchange rate, especially because the number of artisans in the field of boiler replacements are limited as the image of artisans' work in the last decades was not as good as should have been, especially when considering the current market need. End-consumers who already have easy and cheap access to a wood supplier (i.e. properties located in the countryside) tend to switch to a system that uses split logs. The same is true for access to a district heating grid. However, air heat pumps or pellets-based boilers (the latter usually have higher investment costs) tend to be the most popular overall. The preferred technologies vary quite strongly depending on the district's or region's prosperity. In general, provincial, and local authorities are very careful with granting permits (groundwater, noise pollution, etc.), which are necessary before installing a new system and avoids conflicts.

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## Benefits of the Switch and Barriers to Replacement

It seems that many people in Salzburg formerly and still focus on comfort (i.e. as long as it is not really technically necessary, I do not care about other things) rather than on sustainability as the driving force behind boiler renovations. Often the hotel industry, single- and two-family houses and sometimes even farms have oil boilers, while most apartments do not. Only about 10% of the fuel oil in the residential sector is utilized in larger volume buildings. In many prefabricated houses, air heat pumps are available in new buildings. Air heat pumps become more and more popular in the renovation sector too. Many apartments are equipped with gas or even direct electricity heating because they have no central heating. However, awareness on sustainability and climate change mitigation / adaptation and the economic benefits of RES-technologies is slowly increasing. Often, renovations also come when buildings are expanded (multi-generation houses). There is, however, a great need, especially for single and two-family households, to replace old fuel oil or out-worn all-purpose boilers and switch to renewables.

Some common barriers include the unwillingness / fear to change (i.e. why should I switch to an alternative system when everything works?) or the lack of awareness of the benefits that come with alternative systems. Older people have little interest in changing the boiler, as the house will be turned over to the next generation very soon and new owners often carry out a general renovation. One common problem is that buildings are often not having the quality standard they need to be in order to make the switch from fossil fuel to RES very energy efficient. Especially in the case of air heat pumps, the building and sometimes also the in-house heat distribution system would first need to be renovated in order to install the new RE-based system. Furthermore, increasing the size of radiators or refurbishment projects in general are a significant inconvenience, since they can result in a lot of noise and dust. In general, there is a general overall lack of knowledge and awareness that costs can spike if no thermal renovation is undertaken and no low temperature heat distribution system is installed before the installation of modern air heat pump.

Many end-consumers are unwilling to make the switch, because they do not understand how the additional costs of RE-based systems come together. One possibility would be to offer appropriate solutions regarding financing and affordability on top of the free-of charge sample calculations performed by independent public energy advisors as a guide for customers. Other consumers tend to believe that the attractive financial incentives provided by the government will continue to exist for several years and tend to postpone the fuel switch. This was the case especially in 2020, when due to Covid-19 crisis fuel prices went down and fuel oil suppliers in spring sold record volumes of fuel oil, leaving many households stocked up on enough oil for the next one to two years. More communication is needed from the side of authorities and government about the importance of switching to alternative fuels and the limited time frame for fossil fuels. The importance of the phase-out is already reaching people (many already know that fossil resources are finite), but many still see it in the distant future and many do not feel confident in investing in a new technology, when they have felt safe with fuel oil boilers for decades.

Some intermediaries stressed the importance of working together with public energy advisors: independent energy consultants should have visited the house and the installers requested by the end consumer should align her/his concept with the information advisor before the finally assigned installer starts working. Independent advisors provide end-consumers with detailed information regarding available subsidies and an appropriate solution for the situation on the spot (mostly one technology, sometimes two options). Some consumers trust their own feelings or well-known installers more than they do energy advisors, so unless an installer supports the decision to switch, the customer might not do so. A strong cooperation between both parties could improve this situation. Most consumers overlook the fact that their heating system has aged and that it should be switched-out, since they rarely think about apart from using it to heat their homes or in case of malfunction. As a

result, they always end up postponing a system exchange and arrange for some minor repairs until it completely falls apart. The low oil prices also do not provide consumers with enough incentive to switch, since it does not immediately make sense from an economic perspective. Boiler replacement projects tend to rank low on the interest scale for consumers. Due to the low oil prices, many end consumers in case of a sudden break down, which occurs most likely during the heating season, still make like-for-like renewals due to the “emergency” situation in winter. Some interviewees stressed that authorities should take care that for such cases a bridge-over solution, like mobile heating systems or containers are available and affordable. This would allow a pause for professional advice and an informed decision making. In case, in the emergence of a breakdown of an old system, a fuel switch is forced by the government (which is planned in Salzburg from 1 January 2021 onwards), households should not face financial troubles. This is especially relevant for hardship cases, like vulnerable groups or elder people, which frequently experience difficulties when applying for a loan.

A solution for financially weak households is imminent. The Federal Ministry for Climate Protection is establishing a fund (net present value) of EUR 50 million for the assumption of liability by the Federal Government for contracting projects involving boiler mock-ups and/or thermal refurbishment of buildings (occupied by such households). This package is to be put together before the end of 2020. Furthermore, it will need exceptional provisions in case a building is going to be torn down in near future or a prompt fuel-switch is not reasonable for other reasons (e.g. financially etc.).

In general, making the switch to an alternative fuel source tends to be very time consuming and complex in terms of the types of artisans that need to be engaged, which makes it difficult for consumers to undertake such a project. End-consumers require more information regarding the available subsidies and other financial support packages. Other supporting measures could be a general timeline for major renovations or package deals encompassing a number of contacts needed for such projects or in best case one-stop-shops that provide all-around solution packages adequately addressing the main barriers. Frequently, on the other side, it was reported that installers already have plenty of work to do and tend to go for “standard” projects and thus have no pressure to be involved in lengthier, more complex projects. That means that installers have limited interest to advise end consumers to make a building shell renovation first, which is advisable in many cases but often might be challenging because of high investment need.

Furthermore, installers often do not carry out hydraulic balancing or make the correct control and regulation settings on the circulating pump and boiler/oven in modern heating systems. Many customers also are not aware of that at all or do not see the benefit of asking installers to do such checks. A digital system for carrying out the hydraulic balancing could help in this regard, but such technologies tend to be expensive, or need to be applied intensive, respectively to pay off. Therefore, they are not yet offered by specialized service providers which might find a market if it would be advertised and supported by the public hand.

### **1.5.3.3 Business, Experiences, Market and Training**

In general, it can be said that clients with properties related to tourism (for example, vacation rentals and holiday homes) because of larger heat loads result in the largest profit for installers. In general property owners prefer heating systems with high reliability and comfort. Most intermediaries emphasized that heating systems fuelled by renewable energies provide just as much comfort, if not more, as traditional fossil fuel systems (except for log wood boilers). In fact, most argued that there is no logical argument for using oil. In some district, particular renewable energy technologies, like biomass, have a bad reputation, which is not reasonable anymore, due to technical developments applied since over 20 years now. However, there are still prejudices regarding fine dust and damages caused by water ingress into pellet storages that practically have become outdated.

Having a reliable and good heating system is already especially important and general awareness tends to be well anchored in the residents' minds. However, more information needs to be directly communicated that it is possible to change the boilers all year round. Many customers feel like a switch causes exceedingly high costs and needs a lot of effort to coordinate with all the different stakeholders. Communication about boiler exchange should be given a more positive connotation, for example by focusing on heating cost savings and subsidies and that with appropriate planning an exchange is possible even in less than five days.

Several intermediaries argued that especially after the COVID-19 crisis, the government should invest more in climate protection. Politicians have to think "out of the box" and work to streamline regulations, since legislation is often lagging behind the current state of technologies. Politicians should put together income-dependent subsidies, so that even households that have limited financial means would be able to participate in the renovation program. One option would be to give households with older boilers less money, since they need to change out their boiler anyways, while providing the highest funding to those households who have only recently installed a fossil-fueled boiler. Though the energy advisory program in Salzburg is free, many end-users do not know about this service or the advice of the energy advisors is not implemented. The energy advisors invest a lot of time and energy into these services, but the proposed solutions often remain only on paper and are postponed or never implemented as recommended. A follow-up advisory session would be very helpful to clear up any open questions or to finalize the concrete plans for a heating system switch. Some interviewees stressed that it would be necessary that end consumers are approached actively by independent, public energy advisors. It was reported that a pile of 20,000 to 30,000 consultation reports lie untouched at the authorities where people requested an advisory, but it is not clear whether they took any action afterwards.

A further argument brought into discussion was that energy advisors and installers should work together for a common goal instead of focusing on competitive thinking. This would help build trust and actually push customers to make the switch. One direct improvement would be to provide installers that were selected by end consumers to actually implement a fuel switch, directly with the results of the independent advice, e.g. via digital means. Ideally, all those involved (energy consultants, installers, sweepers and manufacturers, etc.) should develop a common solution for a given household and speak a common language. The process should start with independent advice. The information from the initial surveys could be made available to all other involved parties via a common digital information platform, such as ZEUS. ZEUS is a web-based database application of the state of Salzburg. Among other things, it enables the central recording and administration of energy certificates. Via a similar web-based platform, installers could fill in the data required for subsidies, in case end consumers allow them to do so.

Installers are currently faced with the problem of limited apprentices, because young people are not very interested in learned manual professions. The problem is not a short-term one. Many parents have been hoping for better opportunities for their children for decades if they took white-collar instead of blue-collar jobs. Pupil numbers in vocational schools have decreased very sharply (approximately halved in Salzburg vocational school in recent years). The question of whether companies are able to meet increased demand should always be considered, especially in the future with even fewer staff. Many plumbers and also chimney sweeps and other artisans are about to retire within the next decade. High-quality young talent would be the most important for the industry to maintain quality over the next couple of decades. Artisans will become more and more expensive in the future because they have to be paid better and better to prevent them from moving to other companies. It is ultimately a socio-political problem, since craft trades in society do not have a good image, although they are the ones who are trained to actually build an eco-friendlier world.

The lack of personnel in the executing trades linked to boiler replacement was often reported as a problem, since households frequently have difficulties to get several offers from installers. In many cases, only one or two alternatives could be collected. This situation also makes it very difficult to stick to the schedule set out by the local government. By 2030, half of the 50,000 households still heating with fuel oil should have switched towards renewable energy. The market still is far away from the needed 2,500 boiler replacements required.

A short-term solution to the mentioned challenges might be, as an interviewee suggested, to make fuel switches directly in the heating season (from Christmas to March). This is a period of time outside of the traditional “work season” and could be performed with the help of mobile heating containers, for example at larger volume buildings. By such means renovation activities of installers compared to a normal year could be improved by 15-20%.

### **All-round Carefree Packages and Collective Actions**

Most intermediaries welcomed the idea of an all-around carefree package that would be developed together by the public administration in cooperation with relevant artisans and technology providers, since it would lessen the burden for all participating parties. However, some intermediaries expressed their concern about the viability of such a package solution for all types of technologies, since heat pumps, for example, are already very popular. Convincing them to improve or expand their offer might be challenging. Additionally, there are households that want to get involved by themselves. Other intermediaries mentioned they already offer a kind of all-round services and that this would already work. Other interviewees had doubt, if it would be beneficial to cooperate with other artisans and if cooperation could remain stable in the long term. Meanwhile, some other interviewees stated that installers and manufacturers are already so busy, which makes it next to impossible for them to attend events and trainings and discussions on such packages. Such one-stop-shop packages would have to be attractive for the installers and manufacturers (and other stakeholders, e.g. chimney sweepers) alike, otherwise it would be difficult to convince them to participate. More direct and consistent communication is needed in order to reach a broader audience.

Collective actions were perceived to be useful as long as they focused on simple products and projects, like the sourcing of pellets. For the more complex insulation of the top storey ceiling, it was recommended to concentrate on acquiring the construction material, but not focusing on the actual implementation. This would also give consumers more flexibility and independence in the actually implementing the change. The potential liability issue should be clarified with the state government of Salzburg.

The State of Salzburg implemented a “Winterfit” Program a number of years ago that received mixed reviews. The focus of that program was to improve the energy efficiency of the existing heating system, i.e. improvement of pipe and storage insulations, modernisation of circular pumps, hydraulic balancing and check of the boiler’s heating curve and circular pump settings. It was based on a joint action of installer companies and the State of Salzburg. In the interviews, some intermediaries emphasized the importance of such actions, but stated that more funding should be provided to installers, so that they could make a more thorough check (especially regarding hydraulic balancing). The program created large interest from end consumer side. Installers however did not find the follow-up activities, namely orders for boiler replacements and renewals) they hoped for, by getting access to households they would normally not have had access to. In many cases, older people just wanted or needed a temporary solution and did not want to deal with the stress that comes with more complex changes.

### **Training and Education**

Overall, the basic training that is provided in vocational schools is quite good, but the offers on continuing education options can certainly be expanded. Additionally, guilds, professional training providers, industry, authorities and other institutions also provide educational offers. Manufacturers already offer specific product training, but this is directly tied to their products. It was mentioned that installers, due to their workload are not always able to benefit from provided offers for further education. Nevertheless, trainings to become and stay a certified installer or sweeper of biomass heating systems, or of heat pumps or of solar systems, are visited constantly by installers. It seems that this has a positive impact on their businesses. There are a number of training opportunities offered to managers of Austrian Climate and Energy Model Regions<sup>4</sup>, including regularly-scheduled special events that deal with certain topics in each event or the energy consultant course (e.g. the Course A and Course B) offered in Salzburg

## **1.5.4 Mindsets and Interests of Large Investors and Project Promoters**

### **1.5.4.1 Overview**

The situation regarding renewable energies in the heating sector in the region of Salzburg is quite positive due to a broad offer for subsidies and consulting. Nevertheless, some potential for simplification is seen when applying for subsidies.

Renewable heating systems have a lot of advantages for end consumers, e.g. regional supply, higher price stability and possibly a small increase in value of real estate. However, replacing old by new oil heating systems is quite easy and less costly. Furthermore, the ability to determine the provider and the time of delivery makes it attractive to some individuals. In some cases, it might be a sufficient motivation for replacement that a renewable system is environmentally more beneficial, but for others the price tends to be more important.

From a political side, it must be made clear when a phase-out of oil boilers will take place as many do not take this seriously. Furthermore, changes in the funding for contracting projects are needed and in multi-family houses, property managers need to be informed about the advantages of renewable heating systems. If these issues are treated in the right way, more than 50% of oil heating could be replaced by renewable alternatives in the next 10 years.

As there will be a ban on new oil boilers soon, financing will play a more important role in future. Not only subsidies, but also loans and assumptions of liability are needed. Some steps have already been taken.

Interviewees were not familiar with collective actions and thus their use was questioned. Demand response actions are done in most grids, especially in thermal grids when loading time of local storages are staggered. The offers for education in the field of renewable heating technologies are seen in general to be very positive.

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<sup>4</sup> [klimaundenergiemodellregionen.at/assets/Uploads/Publikationen/2018-Fact-Sheet-Climate-and-Energy-Model-Regions-EN-final.pdf](https://klimaundenergiemodellregionen.at/assets/Uploads/Publikationen/2018-Fact-Sheet-Climate-and-Energy-Model-Regions-EN-final.pdf)

## 1.5.4.2 Fields of Interest and General Perception of Consumer Mind-set

### Field of RES-H

The expertise of the interviewees is very broad – some focus on planning and installation (expanding) of new or existing district heating grids, mostly supplied by biomass (some CHP plants), but also absorption heat pumps, PV. Others focus on subsidizing projects like thermal insulation, connection to a renewable district heating grid or installation of a pellets boiler, PV plant, heat pump, etc. Meanwhile, some interviewees offer energy consulting, while others also assist with financing. All of the interviewees deal with single family or small multifamily houses; a couple of them also with non-residential buildings like hotels or hospitals where cooling energy is a topic. Some act like a one stop shop as they offer assistance with planning, approval, subsidies, financing, and advice in the construction phase. Oil plants are rare in the district heating grids; they act as peak load boilers in some cases.

### Main benefits of a RES System for Consumers

There are high subsidies for replacement of oil boilers and installation of heating systems based on renewable energies in Salzburg, better than in other Austrian regions. Therefore, a lot of replacements have already been undertaken in the past. In some cases, the space for a former oil tank can be used. The regional supply with biomass instead of oil from regions far away from Salzburg is often seen as advantage – it supports the local economy, often even personally known economic operators, and is also seen in the context of secure supply and resilience. The pellets price, but also prices for district heating, are more stable than the oil price, which allows a better planning of financing heating costs. Oil systems are less comfortable than gas heating systems; therefore, it is a bit easier to replace them with alternative solutions.

### Barriers for consumers regarding the replacement of an old boiler by a RES system

The replacement of an old oil boiler by a new oil boiler is quite easy. Furthermore, people are used to oil, especially older people. In the western regions of Austria, oil is more popular than in Eastern Austria. A powerful argument for oil heating systems seems to be the independency of a certain supplier, contrary to district heating. The point of time of buying oil can be selected, which seems to be attractive (i.e. saving money by choosing the right point of time for the purchase). Pellet boilers need a bit more maintenance than oil boilers. If there is no central heating system, it is difficult to implement a renewable heating system. Some do not think that phase-out of oil boilers by governmental decisions will take place. Premature boiler exchange is rather unusual – individuals prefer running boilers run as long as they can, which limit the exchange rate. Some systems like heat pumps require a change of the whole piping in the house even if there has been a central oil boiler heating system. The noise emissions can also present an obstacle to some people. Pellet boilers are easier to implement as replacement of oil boilers but show higher investment costs (which is the case for most renewable systems) and the ash has to be removed regularly. Woodchips and logwood require more daily involvement, which is a burden for many, and may cause smoke-related issues. District heating supply regions are generally limited. The simple fear of something new is a reason for staying with a known system as well. In multi-family houses a majority is needed for a system change. The problem is that many owners do not vote, and a lack of a vote is counted as a “no”. This voting principle should be changed in order to allow for replacements in multi-family houses.

### Satisfaction with Current Heating System

There are different views on whether societal pressure and the will to heat ecologically are enough to change from oil heating to renewables. There are rather no technical reasons for a change as oil heating systems are quite reliable. The low oil price lowers the will to change from oil to another energy carrier remarkably. Some also take motivation from the announced phase-out of oil systems (there is

the plan to forbid running oil systems from 2035 and to install new ones in new buildings from this year on; from 2025, boilers older than 25 years shall be phased out in a step-by-step plan). That an oil boiler requires buying oil, produces oil odour and needs space are rather weak arguments against oil, but can be a motivation in some cases.

### **Consumers Plans for a Future Switch**

In 10 years it should be possible to remove between 50 and 100% of the oil heating system stock. However, this number heavily depends on the overall framework conditions. Most important are legal measures (installation ban or even ban on running oil boilers from a certain date), then the price situation (relative prices for energy carriers and subsidies). In many cases property managers also play a role: The majority seems to be reluctant to motivate owners of flats towards replacement. Gas is often the cheapest solution in the calculation of property managers.

### **1.5.4.3 Business, Experiences, Market and Training**

The questions related to the role of natural gas/fossil fuels in their businesses were asked in the previous chapter. The expertise regarding the typical size of the investment range of boiler replacement projects is very diverse among the interviewees. Some see smaller oil boilers easier to replace, some larger. This obviously depends on the focus of the company. Negative and positive aspects of providing consumer with RES heat instead of traditional fossil fuels, main barriers and services interviewees would like to offer to customers were discussed before.

### **Importance of Adequate Financing Instruments and Status**

As of 2021 there shall be a ban for new oil-based heating systems even as replacement for existing ones in the province of Salzburg, especially for hardship cases financing will play an even more important role in the near future. Due to this, especially for poorer households or older people assumptions of liability are needed; higher percentages of funding are not seen as useful. For this, clear rules are needed, and regional or federal government would be in charge of granting such assumptions. For younger or wealthier people also traditional financing (loans) is appropriate. One-stop-shop offers should include 0% interest loans (however, first tries from boiler producers to offer such loans did not succeed). In Austria assumptions of liability by the federal government of 50 million EUR are planned for contracting projects for houses where poorer people live. It is expected that also installers or producers of heating boilers could act as a contractor – even at single family houses; they are not familiar to act as a financing institution - therefore, banks are needed which can closely cooperate with professionals from the heating sector. Contracting could also be supported via an investment bonus, which is set to be 14% for investments in renewable heating systems and thermal building insulation activities. Leasing models could also be appropriate.

### **Marketing of Buildings with DH-RES**

The view on the question whether the value of houses is affected by the heating system was quite diverse. Some interviewees do not have any evidence of such an effect, and they do not take it as an argument for renewable heating systems, some are of the opinion that pellet-based heating systems have a positive effect on the value compared to houses with oil heating. It was also mentioned that at unbuilt land plots without a district heating access it was observed that the previously paid price for the land increased just because of a newly installed access to the district heating grid. However, in professional calculation programs for estimating the value of real estate, this factor plays a role.

### **Policy Support at National and Regional Level**

The subsidies are very generous, especially when compared to other Austrian regions. Application forms are complicated, but this might be necessary. Nevertheless, more efforts needs to be made in

order to make it clear whether a subsidy can be granted from the beginning, otherwise a lot of initially motivated customers get lost in doubts and stop their involvement. The chamber of commerce is very active in supporting oil heating systems, not only by subsidizing them, but also through political interventions. On national scale, there should not only be announcements for phase-out of oil heating systems, but concrete legislation. There is also the idea to stop individual and region-dependent subsidies, but applying a CO<sub>2</sub> tax on energy. Only one office in Austria should be responsible for this which would save a lot of money. There needs to be a legal basis to bring investors in the position to pass the costs for modernisation to tenants (split incentives) as the user investor conflict is a big problem in many cases. 10% of the oil heating systems are in such houses where this problem plays a role. Contracting solutions do not obtain as much funding as investments from homeowners, which makes contracting less attractive. One-stop-shops generate security among customers and make investments more likely.

### **Demand Response Programs**

In most district heating grids the loading of local storages is done sequentially to limit the maximum needed power and depending on the building, heating can be shifted for some hours. There exist scientific programs on how to motivate customers to shift electricity consumption to low demand periods (night, weekend), but the interest from the consumers was low.

### **Information about RES Heating and Cooling Systems**

The education offers are mostly seen as sufficient: some of the companies of the interviewees themselves offer education. The offers from the regional administration are very good. From the manufacturers there is less will to cooperate with energy consultants than before for unknown reasons (maybe compliance rules). However, in schools there is almost no education towards energy efficiency, climate change, etc. at all. Skills shortage is no problem yet, but more has to be done to avoid this in future. Installers sometimes do not follow the instructions made by district heating operators regarding the dimensioning of system components. As a result, the return flow temperature is often not achieved as planned which leads to inefficient operation. This indicates more need in education programs for installers.

## **1.6 Bosnia and Herzegovina - Sarajevo Canton**

### **1.6.1 Main conclusions**

Due to the prescribed measures related to COVID 19, it was not possible to organize focus groups with stakeholders. Stakeholders expressed their opinions and interests through questionnaires and individual meetings. Within the project, energy class A ++ light bulbs were procured and each respondent received 5 light bulbs.

What **end-consumers, intermediaries and investors** agree on is that the prices of the RES systems are high in relation to the purchasing power of citizens. Financing of heating system replacement should be supported through certain financial instruments. Sarajevo Canton has a continental climate and the emphasis is always on heating. Due to climate change, cooling in the summer is becoming an

increasingly pronounced problem in terms of energy consumption. Systems that cover both heating and cooling will be increasingly represented. This is achieved by the REPLACE project and it is a benefit to replace existing heating systems with RES systems.

After conducting a survey in which **70 respondents of end-users** from the Sarajevo Canton participated, it was concluded that, although they do not often think about replacing their system with one based on RES, end consumers are aware of the benefits of renewable energy sources and the added value of the house/apartment they can provide. The main benefit of the RES system that is recognized among users is the contribution to environmental protection and reduction of pollution. The constant supply of energy and the rising prices of other energy sources were also often mentioned. The biggest drawback is the investment of systems based on the use of RES, which is significantly higher comparing to other systems. In addition to the cost of investment, installation is an additional barrier, as it requires additional costs, but also efforts and major structural changes to the facility. Renewable energy technologies which were mostly familiar to the respondents and which they would choose are solar systems and heat pumps. Most users are informed via the Internet. Better information and availability of data through seminars, media campaigns, brochures, online tools and applications would significantly contribute to the growth of interest, and show the population less popular options and their advantages, but also disadvantages. In addition, respondents point out that the transition to new systems would be easier by subsidies, grace periods for funding, grants, techno-economic analysis, promotion of new systems and best practice examples from the other users.

According to the results of the research of opinions/attitudes of **intermediaries/installers in Sarajevo Canton, in which 9 respondents participated**, there is a sufficiently developed market of equipment for heating systems in RES, however, the main obstacle is that the demand for such systems is still low and it is necessary to work through various projects and activities to encourage consumers in using renewable energy sources. The surveyed installers mostly offer heat pumps, solar systems and systems that use wood, pellets and wood chips as the main energy source. In addition to sales, their services include system installation services, modifications to existing installations, servicing, consulting, design and engineering installations and warranty on goods and services. From the aspect of policy support, intermediaries agree that there is not enough support at the national and regional level. They believe that mutual cooperation can have mutual benefits for every stakeholder and that energy advisors can help by educating and advising installers who are increasingly aware of RES. Installers also point out that working with professional associations could help them in the implementation of projects.

The conclusion obtained after the research is that there is a great interest of intermediaries in additional information and education. Preferred sources of information are seminars, workshops, promotional material and online platforms. They believe it is important to point out that there is a need for a quality knowledge centre on an online platform that will cover all aspects of heating and cooling systems and give consumers complete information regarding technical solutions, but also the source of funding and implementation.

As well as installers, investors in Sarajevo Canton are most interested in solar systems, systems based on wood, pellets and wood chips as energy sources and heat pumps. The biggest barrier to the installation of RES systems is their financial aspect, i.e. the cost of investment and the price of equipment. This is precisely the reason that motivates them to use gas/fossil fuel boilers, in addition to already well-established procedures for the installation of gas boilers and obtaining permits, a higher degree of safety in the operation of gas boilers and ease of use.

The conclusions reached on the basis of a survey of all stakeholders show that the main obstacle to the installation and use of RES systems is their high investment costs and inability to finance it by end users. A great desire to improve knowledge in the field of RES was recognized among the respondents of all three target groups. Conducting campaigns, establishing an online platform for exchanging

experiences and information and calculation tools would greatly help in promoting and developing awareness of the importance and benefits of RES

## 1.6.2 Mindsets and interests of consumers

### 1.6.2.1 Overview

As part of the end-user survey in Sarajevo Canton, the research was conducted on the basis of a sample that includes opinions from 70 end consumers. The largest percentage are people aged 46 - 65 years (42.62%), followed by the age group 30 - 45 years (32.79%), and finally users up to 30 years (14.75%) and those whose age is over 65 years (9.84%). The following diagram shows the age structure of the users who participated in the survey.

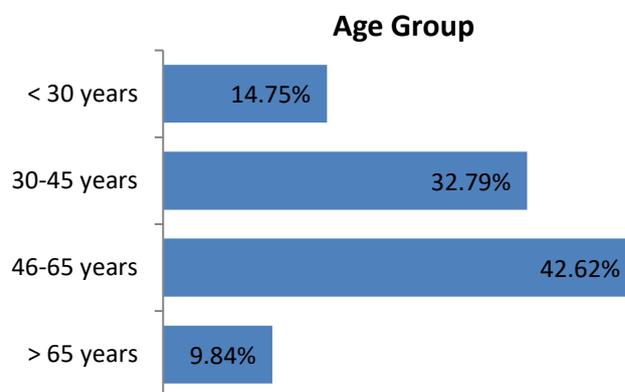


Figure 4: Age group of the interviewed consumers

Almost 2/3 of the interviewed end consumers, 43 of them, live in a family house. The number of surveyed users living in a residential building with up to 10 flats and those living in a residential building with more than 10 flats is approximately equal, which is 13 and 14 respectively. From the aspect of the used heating system, residential buildings are mostly connected to DH or use gas as an energy source. In buildings with less than 10 floors, heating with electricity and pellets is also present. The most common energy source in family homes is wood, followed by gas, pellets, coal, electricity and wood chips. This is shown as a percentage in Figure 2.

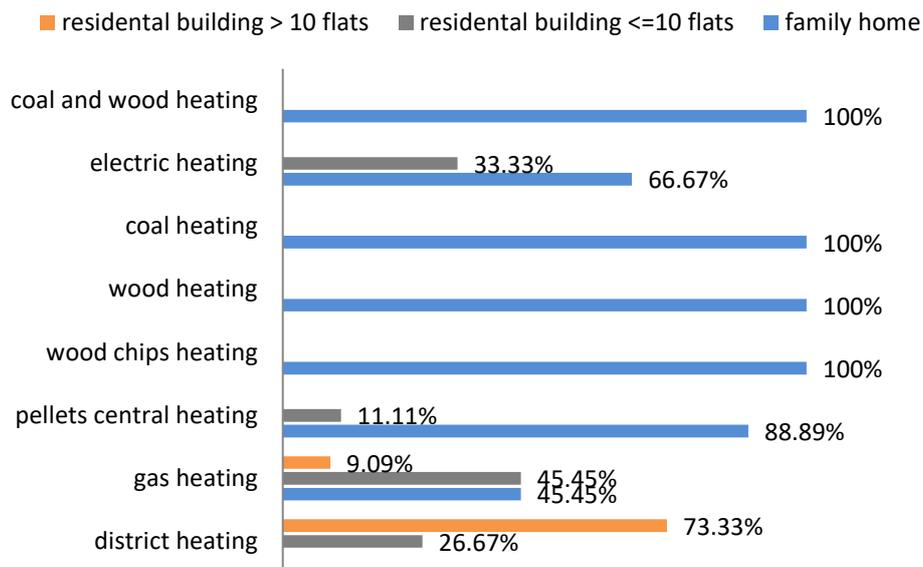


Figure 5: Heating systems by object type

End consumers' opinions on replacing the current heating system with a RES system can be divided into two basic groups:

- Consumers living in individual buildings
- Consumers living in collective housing facilities.

The users who live in collective housing facilities are mostly connected to DH and do not have the possibility to change the heating system. Construction of collective housing facilities in Sarajevo Canton 1970-1990 did not leave the possibility of replacing the heating system and the buildings were connected to the DH. The second most commonly used energy source is gas with a central heating system. Living in collective housing facilities is a barrier to replacing the heating system, because the owners are condominiums and the problem is property-legal relations when there are no same interests and the same opportunities for financing joint ventures. This problem is also present in the part of individual housing facilities where several families use the same building.

The main barrier to changing the current system heating system to RES is the low standard of users, which makes the cost of replacing the system high, often unaffordable. In addition, rising energy prices are a motivator for end users to consider replacing current heating systems with RES systems. Through a survey conducted, end consumers pointed out that techno-economic analysis and online calculators are useful tools that could be helpful in making the decision to replace current inefficient systems with RES systems. When it comes to encouraging replacement, examples of good practice and promotion of RES systems have been identified as one of the important aspects.

### 1.6.2.2 General benefits, barriers, concerns and expectations

#### Main benefits for replacing old heating system with one based on renewable energy

51 surveyed end consumers believe that the biggest advantage of replacing old systems with a new system based on the use of renewable energy sources is the contribution to climate and environmental protection. The next most mentioned benefit builds on the previously mentioned one, 21 respondents believe that RES is an environmentally friendly alternative to imported energy sources. Constant energy supply (15) and independence from price increases (14) are also stated. Providing subsidies to

replace existing heating systems would certainly be a benefit that would encourage end consumers to switch to systems that use RES (10). This analysis is shown as a percentage in Figure 3.

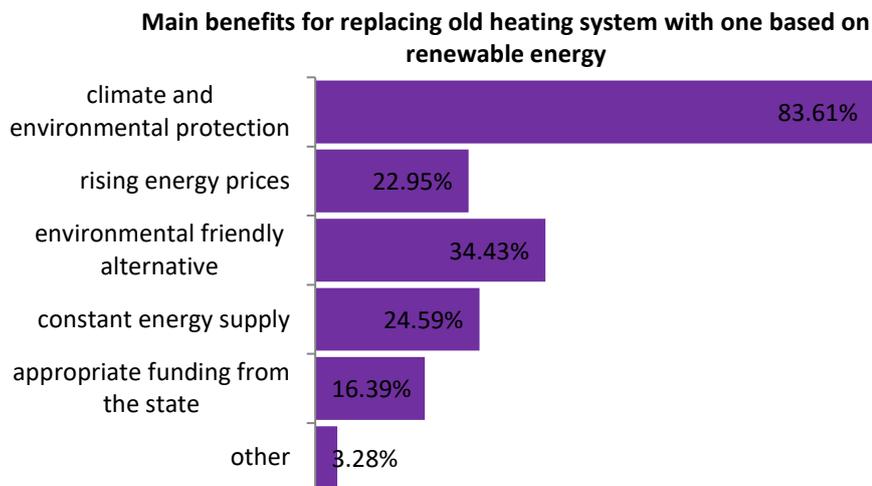


Figure 6: Main benefits for replacing old heating system with one based on renewable energy (the ability to choose multiple answers)

### Main barriers for replacing old heating system with one based on renewable energy

The main obstacle to replacing current heating systems with systems that use RES is the cost of replacement which end consumers find it too expensive (62.3%). Also, they believe that the replacement would require too much effort and structural changes to the building (19.7%).

Consumers living in residential buildings believe that the replacement of the system is difficult to implement due to ownership relations in collective housing facilities, but also due to different socio-economic conditions of tenants. Some end consumers, 3.3%, believe that they are too old and that such an investment cannot pay off for their lifetime. 6.6% of users think that it is not technically feasible to install such systems on the facility they have, while about 20% of end consumers are satisfied with their heating system and are not interested in replacement. Of the total number of respondents, only 1.6% consumers believe that heating/cooling systems on RES are not financially, environmentally and financially acceptable as it is claimed.

### Main barriers for replacing old heating system with one based on renewable energy

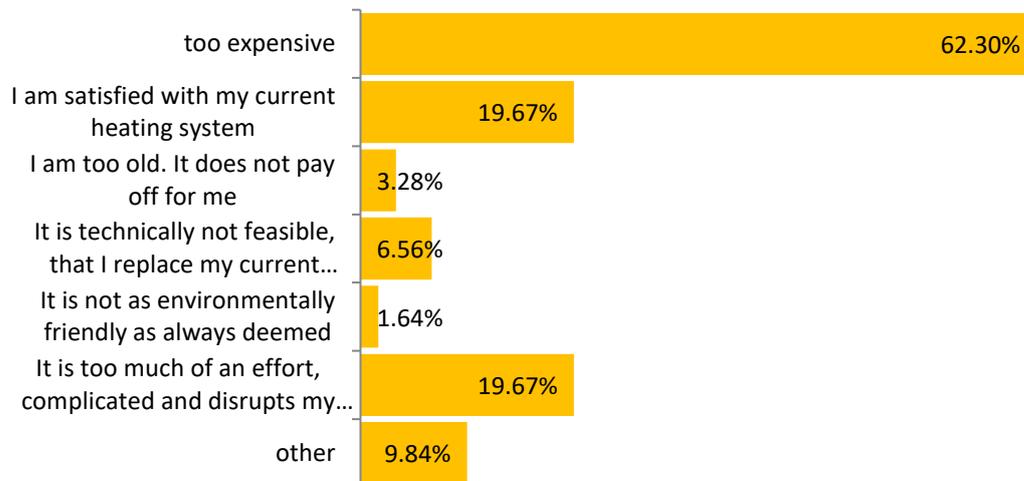


Figure 7: Main barriers for replacing old heating system with one based on renewable energy (the ability to choose multiple answers)

According to the results of the research, the most satisfied are the consumers who use gas as an energy source and have heating through radiator system. Also, the users of pellets are satisfied with their heating systems, but there are divided opinions about working with the system. One part of the users does not see a problem in the need to clean the pellet boiler and fill the tank with pellets, while others consider it as a waste of their time.

#### Form of renewable energy that consumers can imagine choosing for heating purposes

End consumers show more interest in solar systems than in heat pumps. The reason is better availability of the necessary information on solar and photovoltaic systems. Most of the respondents are not familiar with the heat pumps and their operation system, therefore they do not see the benefits of such systems.

#### Reasons for dissatisfaction with current heating system

The main reason for the dissatisfaction of end consumers with the current heating system is the high price of energy (49.18%). The second biggest reason for respondents' dissatisfaction is the negative impact on the environment caused by their current heating systems (42.62%). Additional reasons that are often mentioned are difficult regulation of the system and high energy consumption without the possibility of purchasing a more efficient heating system. Technical failures, repair costs, low heating power and large space required by the current heating system are also reasons for dissatisfaction of the surveyed users.

### Reasons why consumers are not 100% satisfied with current heating system

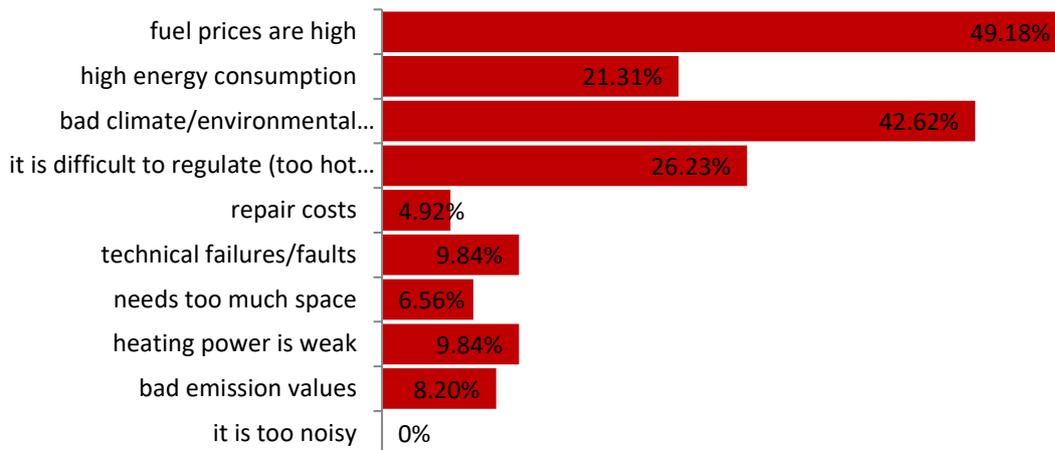


Figure 8: Reasons why consumers are not 100% satisfied with current heating system (the ability to choose multiple answers)

Replacement of the system is mostly considered in cases where appropriate room temperature cannot be achieved, especially where the temperature comfort of the entire space is not achieved because heating is performed in only one room from which the entire space is heated. End consumers who use coal and wood as main energy sources state the space occupied by heating systems and the necessary space for energy storage as the reasons for the heating system replacement.

### Consideration of heating system replacement; changing to a new energy source/fuel

Replacement of the current heating system is not planned by 41 (59%) consumers, 17 (24%) consumers plan to replace the heating system or energy source, while 12 (17%) plan to replace the current system with a new RES system.

### Consideration of heating system replacement

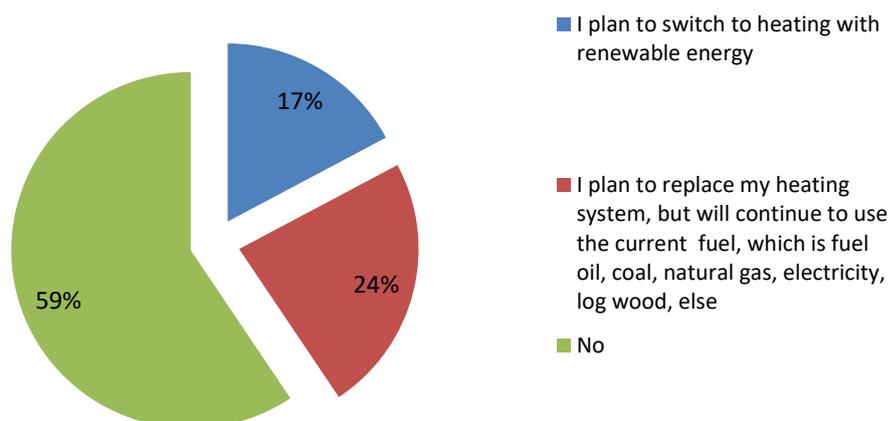


Figure 9: Consumers attitude about heating system replacement

When thinking about changing the energy source, most users would choose pellets as a new energy source. The end consumers of Sarajevo Canton are also interested in switching to gas because of the comfort that this energy source provides. The prices of these energy sources and their growth are a

limiting factor for the transition. It is important to note that some users are thinking about solar systems with the existing heating system, but those make small percentages. Consumers who would not change their heating system are in most cases satisfied with the existing ones, and some of them are not familiar with the possible options or think that the price of switching to RES is too high. This leaves the possibility and opportunity to reduce this percentage if they receive the necessary information which would help them to decide to replace inefficient heating systems.

### 1.6.2.3 Attitudes, channels, and preferences

#### Negative and positive aspects of heating for the consumers

End-consumers, in the first place, expect temperature comfort from their heating systems by achieving appropriate temperature and heating of all rooms. Also, favourable heating price is the desire of all users. For most of them, the possibility of thermoregulation of the system and automated operation of the heating system is important. In addition, the heating system is expected to operate reliably without system failures. Due to energy consumption, most end consumers would like to have systems with a high utilization coefficient and thus systems that would have less impact on the environment. Due to the low standard, customers expect subsidies for energy supplies and subsidies for the purchase of a new heating system.

Of the surveyed users, 28.85% do not think often about possible changes to the heating system or energy source, 25% think often, 17.31% think rarely, 15.38% do not think about changing the system, 11.54% of users in winter think about the possibility of replacement heating systems, and 1.9% of them think about this twice a year.

How often consumers think about the heating system or possible changes to the heating system

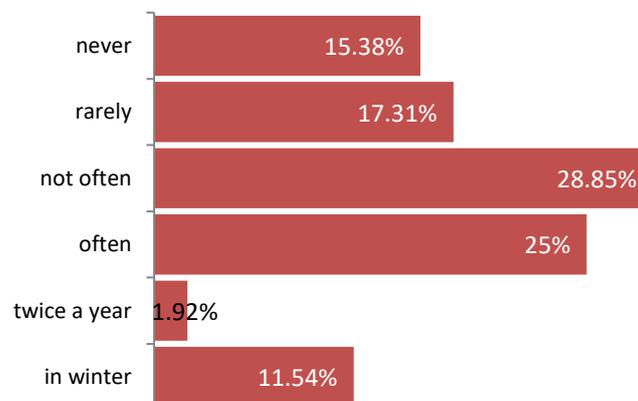


Figure 10: How often consumers think about the heating system or possible changes to the heating system

When the energy source is unavailable, or the price of the energy source changes (price increase) 50% of users think about the possibility of changing the energy source or heating system. 16.67% of users think about changing the system or energy source when the heating system breaks down or a high emergency bill comes. The same percentage of users think about changing the system or energy source when they cannot achieve temperature comfort. 8.33% of users who are thinking about changing the system think about it when they need to manipulate the energy source (unloading coal and wood, splitting wood, carrying wood and coal from storage to the place of burning) and during daily burning and maintenance of fire. 8.33% of users are considering replacing the heating system as part of plans to increase energy efficiency of the building.

Users who do not think about changing the heating system are satisfied with the current heating system (83.33%) or are on DH and do not have the option to change the system (16.67%).

Of the interviewed consumers, 19.35% have replaced the heating system or energy source in the last year. 48.39% of users have replaced the heating system or energy source in the previous 2-10 years, and 22.58% in the previous 11-20 years. 9.68% of users have had the same heating system for more than 21 years.

18.18% plan to replace the current heating system, and 81.82% do not plan to do it. Reasons why users would change the heating system are: more modern system, thermal comfort, less impact on the environment, heating price, automated operation, desire to change the heating system (switch from furnace to boiler) or energy source and additional installation of solar system.

If district heating (DH) was available in all areas of the city, 70.83% of users would be interested in connecting their houses / apartments to the system. 29.17% of users would not join DH. One third of the users would not connect to DH because they think that the price of central heating is high. Other reasons include: inability to connect to DH, satisfaction with the existing heating system, DH does not provide the desired temperature comfort, especially in transition periods (beginning and end of the heating season and periods of low temperatures outside the heating season), inability to manage energy consumption (and thus heating costs) and independence.

#### Consumer criteria to select a certain technology

Criteria that would most influence or already influence consumers when making a decision to change the heating system are: financial capabilities, temperature comfort, savings opportunities, reduced environmental impact, amount of investment for the system, energy price, automated system, system efficiency, technical reliability of the system, continuous energy supply, energy storage space, payback time of the investment in the system, provided service for the heating system.

The most common argument against switching to an efficient and environmentally friendly heating system is primarily the price, i.e. the amount of investment in such system. End consumers also state: impossibility to set up system, property relations, lack of expert advice and services, unavailability of the systems and lack of experience of others with these systems.

#### The consumer perception on whether climate friendly systems increase their home value

91.80% of consumers believe that switching to a new more efficient heating system would increase the value of their house or apartment, and 8.20% of them think that this has no impact on the value of their property.

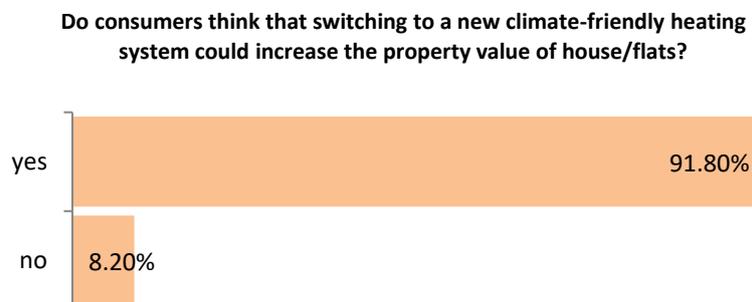


Figure 11: Consumers' opinion whether switching to a new climate-friendly heating system could increase the property value of their house/flats

## **Consumers' opinion on boiler replacement**

When consumers consider replacing a heating system, they talk about it primarily with their family. They ask for information from the installers and service technicians of the heating system they are interested in. The experiences of people who already have a heating system that users are interested in are an important source of information that is considered relevant. Experiences are exchanged with friends and colleagues, and the opinion of the expert is also sought. In collective housing facilities, assistance information is wanted from building managers and caretakers.

## **Arguments and issues against switching to a climate friendly heating system and/or buying them**

As it was previously stated, the most common argument against switching to a climate friendly heating system is price, but also impossibility to set up system, property relations, lack of expert advice and services, unavailability of the systems and lack of experience of others with these systems.

According to users, the price of energy sources and heating systems is high. In total household overhead costs, heating and hot water costs are less than 10% for 4.92% users; between 10% and 30% for 39.34% interviewed people; between 30% and 50% for 44.26% and over 50% for 11.48% respondents. These differences in the percentage share of heating costs in total costs show a large difference in the standard of households in BiH. Households that use the heating system for hot water preparation and cooking and do not have large additional costs (telephone, television, internet ...) have a large percentage share of heating in total costs. For households with a higher standard of living that have the cost of additional luxury, the cost of heating is low.

## **Information sources and channels which consumers uses**

The sources of data that consumers use when thinking about changing the heating system/energy source or making decisions about replacing the system/energy source are in 75% cases the information that can be obtained online. In 10% cases, information obtained from trainings and seminars is used. 5% of users take information from the catalogue of companies dealing with heating systems. Based on the energy class of the building, 5% of users make a decision on the heating system, and 5% of them take the data on the heated surface of the building as initial information for the selection of the heating system.

## **Experiences with installers, maintainers, etc.**

If the heating system does not work properly, 76,36% consumers will turn to installers and service technicians for help. 9.09% of users will contact the public utility company of the district heating system, while 5.45% of users will decide for independent repairs. 3.64% users will turn to building managers, and 3.64% of them will ask for help from chimney sweepers. In the end, only 1.82% end consumers will turn to those with the best price for help.

Of the surveyed users, 87.72% trust service technicians, installers and chimney sweepers. The reason for the trust is the good cooperation so far, the experience that service technicians, installers and chimney sweepers have in the work, professionalism in relation to clients and professional performance of work, their training and trust in the authority of the service company. 12.28% users do not trust service technicians and installers because they think that there are not enough good masters and service technicians, and they think that there is a lack of professionalism.

16.22% of respondents are satisfied with the scope of services provided by installers, service technicians and chimney sweepers and believe that there is no need for additional services. The same number of respondents would like to have additional information and education about the used heating system and the possibilities of other heating systems. 10.81% of respondents would like a better and more complete service, 10.81% more frequent inspections of heating systems. 10.81% of users want a lower price for services. 13.51% of users see regular system service (annually) as an

additional service, about which service technicians would keep records and inform users when it comes time for regular inspections and system services. 8.11% of users would like to receive a warranty on the work performed and just as many would like to receive additional advice from a service technician. With servicing, 5.41% of users would like system maintenance as an additional service.

### **Information that consumers would like to have regarding the renovation of their heating systems by a more climate friendly one and their opinion on how to make boiler replacement more interesting**

Users believe that the following would be helpful for informing them when choosing an environmentally friendly heating system: presentations for citizens (29.17%), positive experiences of users of new systems (25%), information leaflets (20.83%), media (12.5%), techno-economic analysis of investments in new systems (8.33%) and analysis and system for cost calculation (4.17%).

Replacing current heating systems with RES systems would be more affordable in the opinion of end consumers if prices were more favourable (33.33%), by subsidies (33.33%), with hiring energy consultants to select the system and conduct techno-economic analysis (23.81 %) and by providing grant funds (9.52%).

66.7% of users would participate in collective activities of heating system replacement, 15.38% of users consider them desirable, 12.82% of users would not participate in such activities, and 5.13% of users do not have an opinion on collective activities. Although most consumers are interested in collective activities, they find them difficult to implement due to the different interests and social status of all those who would be involved in these activities and because it is difficult to resolve property issues. End consumers believe that replacing heating systems would be more accessible and simple for them with: better information, technical and professional assistance, lower prices, subsidies, organization at the local level, techno-economic analysis, promotion of new systems, examples from practice, grace periods for financing and grants.

The content and format of information as well as sources of information that would be interesting to users and encourage them to use new heating systems are in the opinion of users: promotional materials and offers, information on the Internet, professional and technical presentations and brochures, examples of good practice, media education, video materials, specialized TV shows, graphics and comparisons, applications and databases, categorization of objects into energy classes.

## **1.6.3 Mindsets and interests of intermediaries**

### **1.6.3.1 Overview**

The survey was conducted with the participation of 9 intermediaries/installers dealing with heating and cooling systems in Sarajevo Canton. The research was conducted through individual meetings, but also online through the submitted questionnaires. According to the results of the research of opinions/attitudes of intermediaries/installers in Sarajevo Canton, there is a sufficiently developed market of equipment for heating systems in RES, however, the main obstacle is that the demand for such systems is still low and it is necessary to work through various projects and activities to encourage consumers in using renewable energy sources.

Intermediaries/installers through their work offer a complete service that, in addition to selling equipment and systems to end users, includes system installation services, modifications to existing installations, servicing, consulting, design and engineering installations and warranty on goods and services.

The biggest barrier identified by intermediaries/installers in the application of renewable energy sources in Sarajevo Canton are the prices/investments of the systems, i.e. the inability to finance the replacement of the system by a large number of consumers.

When it comes to market experience on customer satisfaction with renewable energy systems, the experience is mostly positive, and consumers who have decided to replace the existing heating system are satisfied with the benefits. Also, there are still some users who do not decide to replace the existing inefficient heating systems because they believe it is a good choice. According to the above, it is necessary to work on the promotion of RES systems, so that end consumers see the benefits of these systems and make informed decisions.

According to the answers of the installers in Sarajevo Canton, there is enough knowledge on the market about the systems they sell, but they believe that they need more new information about RES systems and a platform on which they can exchange knowledge and experiences. It was concluded that through the synergy of different participants of end consumers, installers, investors, financial institutions, authorities, the current situation can be improved and better information to all participants can be provided, which results in increasing the percentage of renewable energy in the heating system of Sarajevo Canton.

### **1.6.3.2 Fields of interest and general perception of consumer mindset**

#### **Field of RES-H they are focused and/or interested**

Intermediaries in the Sarajevo Canton that sell systems and equipment for heating systems, in addition, offer services for installation and servicing of equipment. Through the survey, the installers stated that they offer: heat pumps (air-air and water-water), solar systems, heat storage techniques, district heating equipment, control and regulating valves in the heating and cooling system; consulting; design and execution of mechanical installations; investment assessment; conceptual design solutions. In addition, the companies also offer wood and pellet boilers, energy delivery and storage systems, as well as fossil fuel boilers and stoves.

According to surveyed installers, heat pumps are mostly offered (71%), followed by systems based on wood, pellets and wood chips as energy sources (57%), and solar systems (43%). A visual representation of the percentage of certain RES technologies in the offer of respondents is given below (Figure 9).

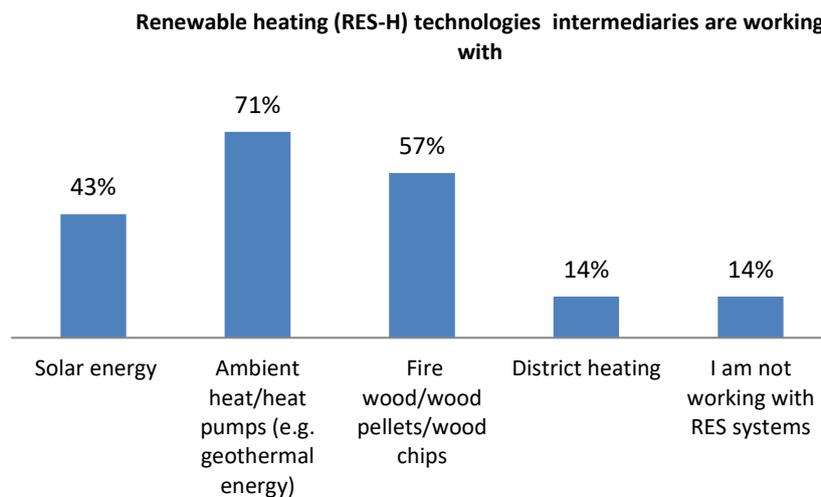


Figure 12: Renewable heating (RES-H) technologies interviewed intermediaries are working with ((the ability to choose multiple answers)

### What are for them the main benefits for consumers when installing a RES system?

According to the installers' experiences, the main advantage for end consumers when installing a RES system is based on the reduction of energy costs through costs of energy source, and savings through lower maintenance costs (71%). An important advantage is the contribution to pollution reduction and environmental protection (57%). They also emphasize the constant supply of energy, i.e. achieving thermal comfort (43%), and simple system management (43%) which means its automation, no storage or physical work around the energy source and heating system and no space required for energy storage.

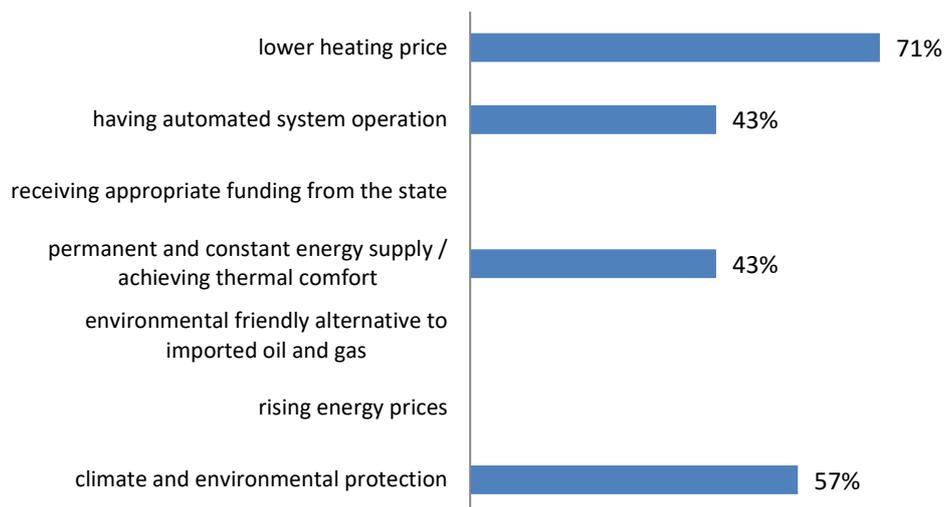


Figure 13: Main benefits for consumers when installing a RES system, according to installers (the ability to choose multiple answers)

### What are the barriers to consumers when replacing their old boiler with an alternative system?

Barriers for consumers to replace their system with a system based on the use of renewable energy sources that the installers have recognized is primarily the price, which is high compared to the low

standard of the population. The initial investment is significantly higher compared to other heating systems, because in addition to the purchase of the system, it is necessary to work on the reconstruction of the entire space due to the installation of low-temperature heating bodies. Due to the price, the problem is the financing of the system and the payback period. The solution to the problem of investing in system replacement could be incentives from the Government/local government or international co-financing programs.

As one of the obstacles to replacing heating systems, installers see the mentality of end users, i.e. unwillingness to try something new, so end consumers find it difficult to decide on changes and often have prejudices when it comes to new heating and cooling systems. Also, the obstacle mentioned by the installers in Sarajevo Canton is the condition of buildings that are mostly without facades and building permits, which contributes to the fact that the installation of new heating and cooling systems, especially those that use renewable energy sources, is not sustainable.

### **What are the reasons why consumers are not satisfied with their current heating system?**

According to the experience of installers, end users are generally dissatisfied with current heating systems. The reasons for dissatisfaction depend on the system and the type of fuel they use. What is mostly stated is inefficient heating, failure to achieve the desired temperature and heating only part of the space, i.e. one room, which doesn't achieve thermal comfort. In addition, there are: loss of time and energy during heating, maintenance and cleaning of the system, the problem of disposal of waste material after combustion, space requirements for storage and handling of energy source, high energy costs and constant increase in energy prices, uncertainty in energy delivery, inefficiency and non-functionality of the system, complex management system, inability to pay according to consumption (with district heating systems).

What is important to state is that installers think that consumers who have inefficient heating systems are often satisfied with it because that is their choice.

### **With how many counselling clients do you estimate that they will replace their old heating system within one year and if so, towards which energy source?**

It is difficult to estimate how many consumers will decide to replace the heating system in the next year, given that the market is unpredictable and needs of end users as well. In addition, the installers stated that due to COVID-19, which further weakened the financial situation, the economic conditions have changed, and a small number of consumers will decide to replace the heating system in the next year.

One of the advantages they mentioned is that they certainly believe that in the coming period, systems that use renewable energy sources will be increasingly represented on the market and promoted, which will affect people's awareness and the number of replacements of inefficient heating systems in the future is expected to increase. According to one of the installers participating in the survey, the number of clients is not known, but according to historical data and experience, looking at pellets and heat pumps, between 1,500 and 2,000 clients will invest in RES during the year.

From the point of view of Sarajevo Canton installers, the main information that needs to be provided to users to convince them to replace the heating system are: reducing heating costs, i.e. how much they will save when replacing the heating system and what are their main benefits, user comfort, simple operation and use of new heating systems, efficiency, quality and reliability. In the end it is important to prove to end users that heating costs will be lower with an acceptable payback period. 43% surveyed installers believe that proof of cost reduction and payback period are the most important information for end consumers (Figure 11).

Financial resources are a major factor in deciding on the method of heating, so it is necessary to provide timely information to end consumers that will give them an incentive to decide to replace inefficient heating systems.

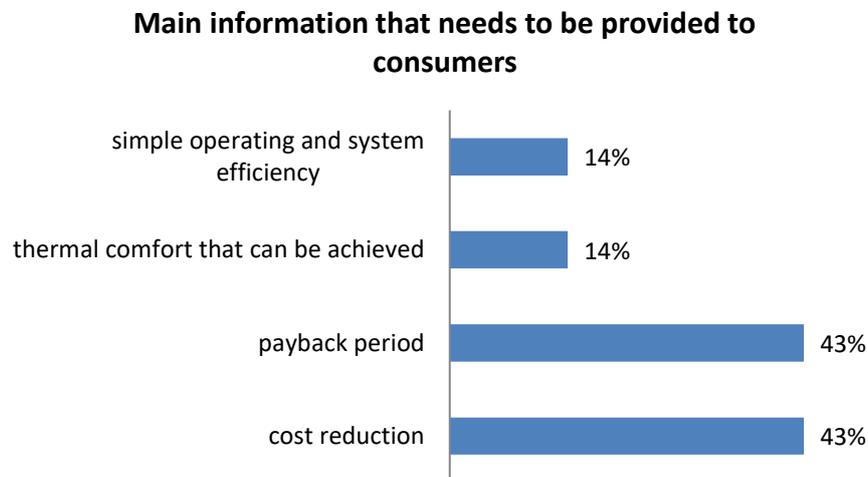


Figure 14: Main information that needs to be provided to consumers, according to installers

### 1.6.3.3 Business, experiences, market, and training

#### What gives them more benefit, traditional fossil fuel heating systems or RES-H systems

According to the results of the survey and interviews with installers of heating and cooling systems in Sarajevo Canton, it is pointed out that higher profits come from the sale of RES systems and sales of condensing devices, but the market for these systems is smaller and consumers who have better financial conditions mostly decide to purchase them.

#### Negative and positive aspects of heating for the consumer

According to the experience of installers, the identified positive experiences with users of renewable energy systems lie primarily in customer satisfaction due to evenly heated space, saving time on heating and cleaning the system, provided temperature comfort throughout the year and reduction of monthly energy/heating costs. There are generally no bad experiences other than unrealistic expectations from the system in the winter months, especially in buildings that do not have thermal insulation of the facade and have large losses through the building envelope.

#### Which is the main barrier they see for the consumer to finally install a new heating or cooling system?

The criteria that is most often used by consumers when choosing a new heating system are: system price (unfortunately users in most cases do not understand the difference between investment and operating costs of the system), price and type of fuel, investment amount and payback period, system efficiency and quality, as well as appearance, equipment, warranty and service. All these items result in the creation of the main obstacle for users when installing a new heating or cooling system, and that is the price, i.e. investment in the system. The installers pointed out that insufficient education of consumers is an additional obstacle and that the users, in general, do not like changes and due to lack of information, they still decide not to invest in new heating/cooling systems. Also, it is stated that a certain percentage of individual buildings in the Sarajevo Canton are without facades and building

permits, which makes it difficult to implement system replacement, and in addition, the payback period for such types of buildings is still large.

### Do they feel there is enough policy support at national and regional level?

When it comes to the use of renewable energy sources, respondents pointed out that there is not enough political support at the state and regional levels. Declarative support is appearing to a lesser extent, and there is almost no practical support in the field, which makes their work even more difficult. In addition to the lack of political support, they have additional costs that arise through the disposal of electronic waste, packaging waste, etc. There is no financial support and greater public promotion and education is needed to make progress in terms of increased use of renewable energy sources.

### What do they think about collective actions, would they like to take part in promoting them?

Opinions of intermediaries on whether collective actions help the market acceptance of renewable heating systems are different and divided. One part of the respondents (57%) thinks that they facilitate the work, another part thinks that they facilitate to a lesser extent (14%), while the third part of the respondents think that collective actions do not facilitate the market acceptance of renewable heating systems (29%).

Do collective actions help the market acceptance of RES systems

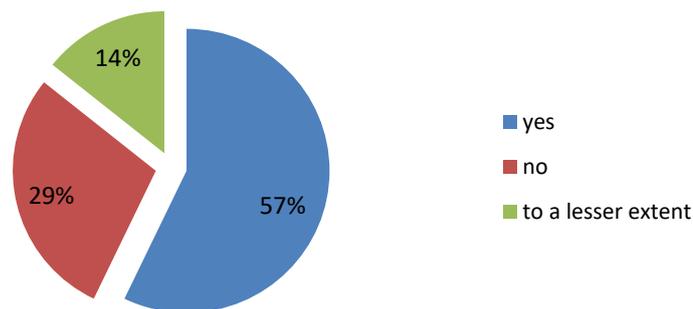


Figure 15: Opinions of intermediaries on whether collective actions help the market acceptance of RES systems

### How could energy advisers and installers etc. help each other, by which means?

Energy consultants and installers can help each other primarily by exchanging information and sharing information from the field and different experiences. Energy consultants need to educate and advise installers who are increasingly aware of RES. In addition, energy advisors should be more present in the field and point to the benefits of RES use on concrete examples, which can directly affect the increased percentage of RES use. The installers pointed out that they need information and practical experiences from the field which can be obtained by cooperating with energy consultants. Also, mutual cooperation can have mutual benefits since installers can also share their experiences with energy consultants in order to jointly improve the market situation.

### In what they would like to increase their knowledge?

Intermediaries would like to improve their knowledge in the areas of heat pumps, solar roof panels and in the area of variant refrigerant flow (VRF) systems.

### Are professional associations supporting the RES systems enough, and if not, why?

Intermediaries have divided opinions on the associations' support for new RES systems. One part of the respondents thinks that they support (25%), while the other part that the support is declarative and depends on the interests of the association (25%). In addition, the installers believe that they do not have enough information for a specific answer (50%), given that in the Sarajevo Canton they have not had cooperation with associations that could help them in the implementation of projects.

Are associations supporting the new RES systems enough?

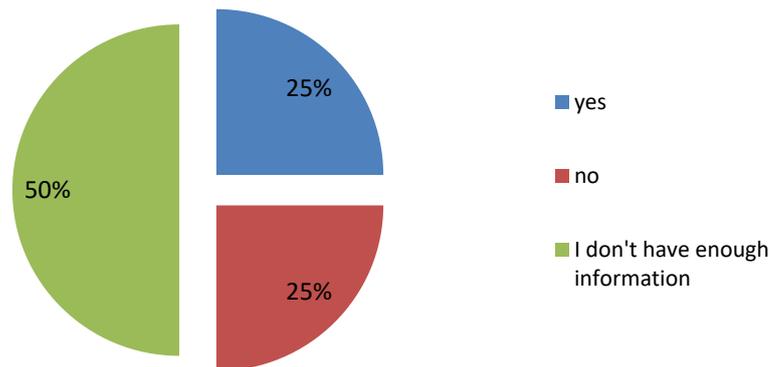


Figure 16: Opinions of intermediaries on whether professional associations support the RES systems enough

It was identified that consumer associations are not yet defined or active in general in the Sarajevo Canton, or in BiH, so in most cases it is not possible to talk about support or lack of support regarding the RES system. It is necessary to encourage users to associate and to act through associations, in order to enable a greater and better effect when it comes to the use of renewable energy sources, but also in general use of heating and cooling systems.

### Where do they look for information about RES heating and cooling systems?

Sources and ways of informing consumers about RES services and systems that the installers stated as mostly used are: leaflets, brochures, presentations, websites, catalogue documentation, direct communication and flyers at home addresses. User consultations are performed by agreed home visits and those are a win-win technique in this area in order to advise consumers. The best way to inform intermediaries about renewable energy systems for heating and cooling are conferences, seminars, workshops, promotional material and online platforms.

What is important to point out is that there is a need for a quality knowledge centre on an online platform that will cover all aspects of heating and cooling systems and give consumers complete information regarding technical solutions, but also the source of funding and implementation.

## 1.6.4 Mindsets and interests of large investors and project promoters

### 1.6.4.1 Overview

The survey among investors was conducted with the participation of 6 respondents. As well as installers, investors in Sarajevo Canton are most interested in solar systems, systems based on wood, pellets and wood chips as energy sources and heat pumps. As the main advantages of RES systems investors point out environmental acceptability and constant energy supply.

The biggest barrier to the installation of RES systems is their financial aspect, i.e. the cost of investment and the price of equipment. This is precisely the reason that motivates them to use gas/fossil fuel boilers, in addition to already well-established procedures for the installation of gas boilers and obtaining permits, a higher degree of safety in the operation of gas boilers and ease of use. Investors' opinions on the number of users who will change their heating system during next year are divided.

A large number of respondents believe that the percentage varies between 10% and 20%, but there are also those who believe that a very small number of consumers will replace their heating system due to bad financial situation caused by the COVID-19 pandemic. There is an interest in additional education and new sources of information. Also, all investors believe collective actions are useful for raising public awareness of citizens and would like to participate in these activities. Investors from Canton Sarajevo believe that investments in RES systems and equipment are high, which is, at least for now, barrier to using these systems. Even so, they are aware that RES technologies are the future, and that they need to be used more often.

### 1.6.4.2 Fields of interest and general perception of consumer mindset

#### Field of RES-H they are focused and/or interested

RES systems that respondents are most interested in are solar systems (100%), followed by systems based on wood, pellets and wood chips as energy sources (75%), and heat pumps (25%). Additional education and information would create interest in other technologies, but also increase the existing ones for the already listed systems.

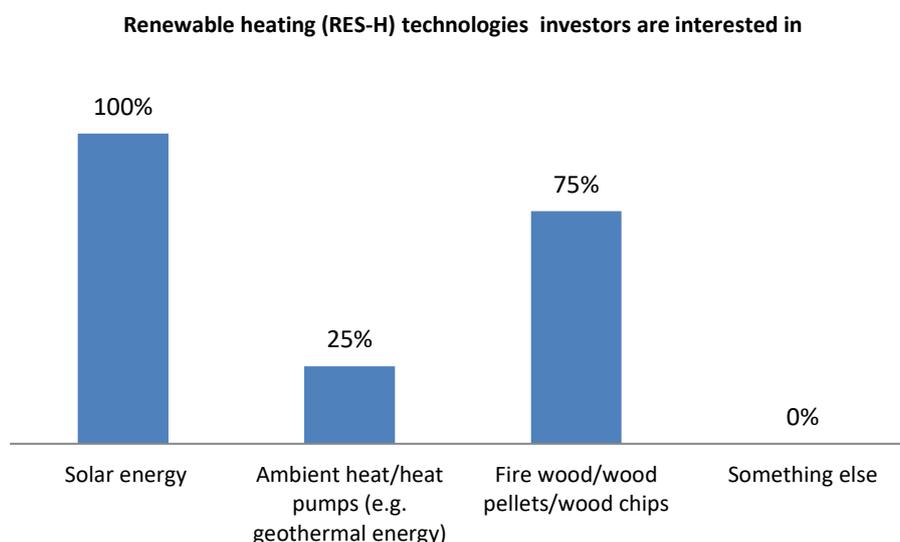


Figure 17: RES technologies interviewed investors are interested in ((the ability to choose multiple answers)

### What are for them the main benefits for consumers when installing a RES system?

As the main advantages for users of the RES systems, investors point out the reduction of heating costs, i.e. the economic profitability of the investment that is being realized, and the positive impact on the environment and the reduced contribution to pollution.

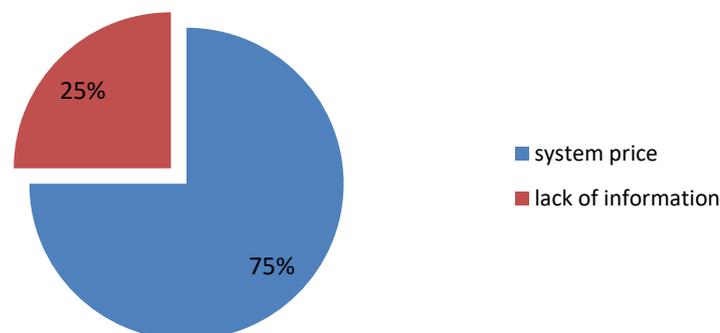
In addition, they consider the safety achieved through the use of RES to be a great advantage, since dependence on the availability and price of energy source is avoided, while constant energy supply and thermal comfort are achieved.

### Which are the barriers for the consumers regarding the replacement of their old boiler by a RES system?

The majority of respondents (75%) agree that the biggest obstacle for end consumers to replace the existing system is the high cost of investment and installation of RES system. This could be facilitated by state subsidies and the provision of grants to people who decide on replacement of their old boiler by RES system.

The lack of education and information of users about RES systems and the benefits they bring is also highlighted. Promotional campaigns, examples of good practice, an online platform for sharing experiences and applications would greatly help to bridge this barrier.

**Main barriers for replacing old heating system with one based on renewable energy**



**Figure 18: Main barriers for replacing old heating system with one based on renewable energy, according to investors**

The main reasons for user dissatisfaction with the existing system are the high costs in the heating season. In addition, the time and effort required to maintain the system is also pointed out.

### Which percentage of consumers they perceive that will change soon (within 1 year from now) their heating system and by which new fuel/system?

According to investors, the percentage of end consumers who will change their heating system in the next year is between 10% and 20%, as the uncertainty of fossil fuel supply is increasingly recognized, but also the negative impact on the environment and air pollution caused by existing systems.

However, there is also the opinion that a very small number of users will replace their heating system in the next year. The situation caused by the COVID-19 pandemic has had a negative impact on the

already unenviable financial situation of the population in BiH, so it is difficult to expect changes without the help of the state or international funds.

### 1.6.4.3 Business, experiences, market and training

#### What motivates them to use natural gas/fossil fuels instead of RES?

The motivation for using gas/fossil fuels instead of the RES system is primarily the price of investment and energy source. It is also stated that there are already well-established procedures for the installation of gas boilers and obtaining permits, a higher degree of safety in the operation of gas boilers, and ease of use.

#### What is their range size of investment (from xxxx € to yyyy €)?

The range of investment in the heating / cooling system depends on the size of the investor and can be divided into two groups:

- from € 1,000 to € 250,000 for smaller investors
- from € 200,000 to € 500,000 for larger investors.

#### Negative and positive aspects of providing consumer with RES heat instead of traditional fossil fuels

As a positive aspect of supplying consumers with heat from the RES system instead of fossil fuels, investors primarily state the efficient operation that the system achieves (50%). In addition, possibility of achieving a constant energy supply is significant, i.e. unquestionable energy sources (25%), and environmental acceptability (25%).

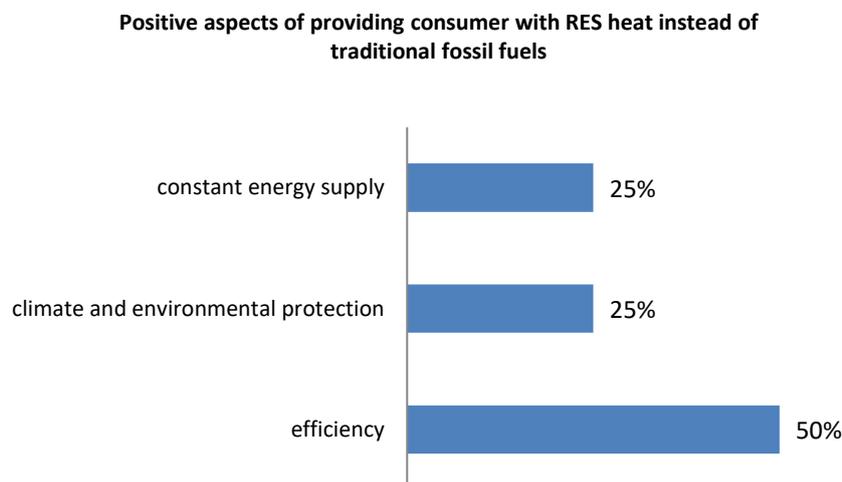


Figure 19: Positive aspects of providing consumer with RES heat instead of traditional fossil fuels

The negative side, according to all respondents, is related to the financial aspect of the RES system, i.e. the price structure of RES, the value of the initial investment, investment in equipment ...

Investors are not familiar with the Demand Response program taking into account that this program is in phase of development in BiH.

#### Which is the main barrier they see for the consumer to finally install a new heating or cooling system

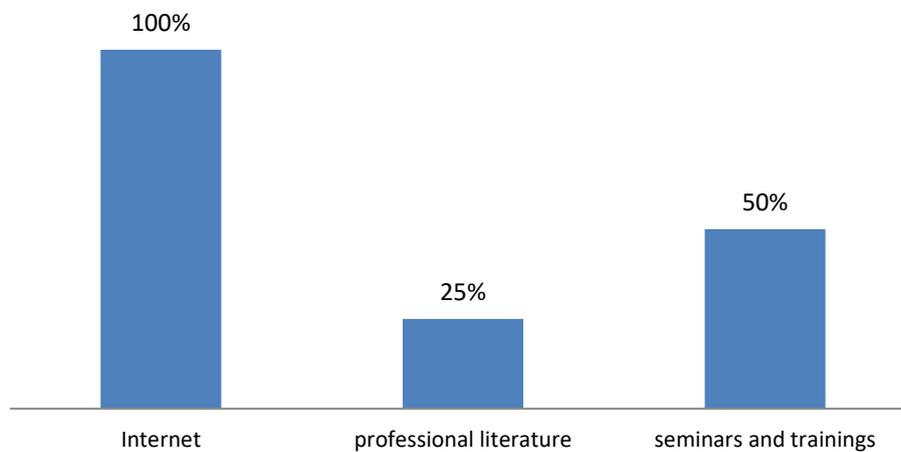
Regarding all that has been mentioned so far, investors believe that the main barrier for customers to replace the heating system is the price, i.e. financial opportunities to invest in the system and equipment as well as high costs of replacing old installations with new bodies. Also low education of the population about RES system options and their benefits is not beneficial.

**What do they think about collective actions, would they like to take part in promoting them?**

All investors believe that collective actions are useful for raising public awareness of citizens and would like to participate in these activities. They point out that the support of local authorities is key to the promotion of new technologies and greater use of RES.

The most used source of information for investors is the Internet, followed by seminars, trainings and conferences, and finally professional literature.

**Investors' sources of information about RES heating and cooling systems**



**Figure 20: Investors' sources of information about RES heating and cooling systems ((the ability to choose multiple answers)**



## 1.7 Bulgaria

### 1.7.1 Main conclusions

#### Regional specifics

The Rhodope region is very specific in terms of demographics and socio-economic conditions. The region is remote and mountainous, with many depopulated settlements and mostly elderly people living in individual houses. There are Turkish ethnic minorities in the southeast part of the mountain and communities of pomacs (Bulgarian Muslims) in the central part, which are livelier and with higher population density. People have low income, most of them or their kids work abroad. There are few employment opportunities in the region, unemployment is high.

#### Consumers

Expectedly, the interviews with people using wood, coal and electricity (mainly non-efficient appliances) revealed certain differences in the attitudes of the different consumer groups. Younger people are concerned about the impact of the inefficient forms of heating on environment and health and are open to new solutions, while elderly people are not keen on changing their habits and traditions. For all groups however the energy price constitutes a big item in the family budget and high investments needed for heating modernization are a serious obstacle to undertaking improvement measures. Pellets are mentioned as a most preferred option, although people add or mount when possible, electric heating sources, most efficient being air-conditioners. Information about suitable and affordable technologies is welcome, as well as about financial support schemes.

#### Intermediaries

Installers confirm the preference of pellets by the households in the Rhodope Mountains. They point to the high investment costs and lack of finance, negative experience from national programs and negative personal experience from the discrepancy between expectations and real results as main barriers for switching to RES heating systems.

There is a common recommendation to review the national programs and pay special attention to their current weaknesses while designing new programs. Engineers with sound experience in the RES heating installation market should be involved in this process, in order to guarantee the success and sustainability of these programs.

#### Project promoters

There is a small number of building and investor companies left in the region. Builders usually are not involved in deciding on and providing heating solutions for the buildings they construct. They are involved only in the case of multifamily houses in regions with district heating or natural gas supply grids. RES heating is not considered at all or in rare cases it is an individual owners' choice.

RES heating in multifamily houses should be supported by the government through appropriate regulations regarding energy distribution, urban planning by heating type, review processes of construction permission approval and requirements for new buildings.

## 1.7.2 Mindsets and interests of consumers

### 1.7.2.1 Overview

In the Rhodope Region, telephone interviews were held with 21 consumers of different age groups (up to 45 [6], 45-65 [6], above 65 [9]) and places of residence (towns [14] and villages [7] from Smolyan and Kardzhali municipalities). The respondents have been selected among people heating their homes with wood, coal, electricity (mainly non-efficient heaters), and/or combination of those.

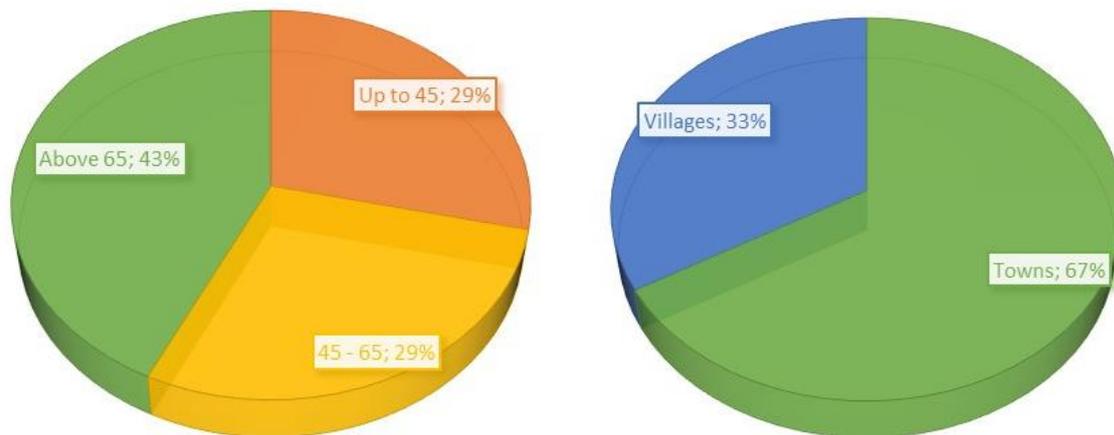


Figure 21: Consumers' distribution by age groups and places of residence

Most of the respondents are satisfied with their heating or find it acceptable. Only two of them unconditionally state that they are not satisfied but are unable to undertake changes. Although most respondents state that they would shift to pellets, the most applied technologies by those who have already started taking actions, are air-conditioners and convectors. The reasons for this vary – some ecology-oriented individuals do not want to use fuels that contribute to the deforestation, others choose them because of their cleanliness, easier operation and servicing and ability to heat up quickly the space, convectors are seen as an option that is better to health.

The main reasons for the lack of interest in replacing the inefficient heating systems and sources with efficient ones fuelled by RES, are the high prices of modern technologies (financial) and the prevailing habits of the mountainous people, who have used local wood resources for generations and are convinced in their effectiveness. Furthermore, the common opinion shared by almost all respondents is that there is no other heating source that brings so much warmth and ambience like wood.

### 1.7.2.2 General benefits, barriers, concerns, and expectations

#### Satisfaction

Most of the respondents shared the conviction that wood has no alternative from the point of view of heating comfort and cosiness. Furthermore, the availability of woods in the closest vicinity makes this fuel easily accessible and the cheapest among all. However, all respondents point out as a main disadvantage of wood as a heating fuel the spadework involved, alongside burdensome maintenance, dustiness, ashes, buying and carrying the wood to the upper floors, smoke and the necessity to paint frequently the walls of the rooms where such stoves are burning, etc. Younger people consider also the serious ecological and health issues connected with wood firing and severe cutting of woods in the region.

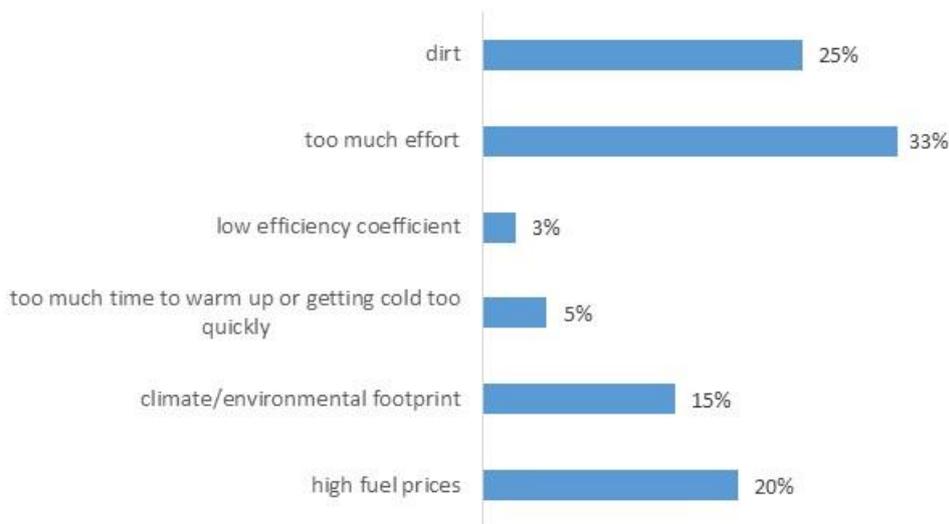


Figure 22: Negative sides of the current heating system

### Replacement

Most interviewees are satisfied with their heating systems and do not plan to replace them.

Some of the respondents however have started changing their heating system or added another heating source (air-conditioner, convector). In most cases, air-conditioners and other electric heaters are used as an auxiliary source, when the owner needs to quickly heat a room. Although heating based on electricity is considered cleaner and easier to operate, there is a general opinion that the electricity prices are too high.

Elderly people who have changed their heating source (from wood and coal to electricity) have done so because of a physical inability to service and maintain such systems. Often it is their children's decision to change the heating type and the children provide financial support for this.

Some respondents note that there is a positive tendency more people to install stoves and systems on pellets.

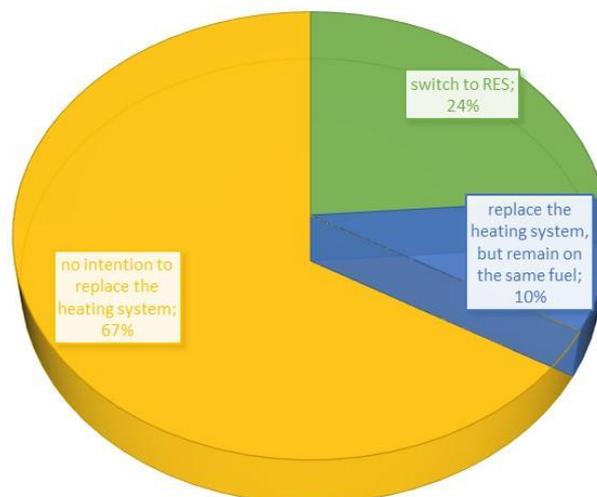


Figure 23: Intentions of consumers to replace their heating system

## Barriers

Financial aspects of replacement are pointed out as the main barrier. Furthermore, modern technologies are considered too expensive and in case the change is inevitable, an option will be chosen that is appropriate to the available budget.

People renting a property, usually either do not have the freedom to choose the heating source by themselves or are not motivated to invest in significant home improvements.

However, another major barrier needs to be dealt with – the attitude of mind and the deep-rooted habits. Several respondents shared observations about the prevailing perception in their neighbourhood. There are many villages in the Rhodope Mountains inhabited almost entirely by elderly people (above 70 years old). These people would never change their heating habits. (This was directly stated by one of the interviewees as well, who told they were completely satisfied with their heating on wood and would never change it for anything else). Surrounding forests have been supplying these people with wood material at low or no cost for whole their lives. It should be noted also that wood stoves are used both for heating and for cooking, which makes them totally effective and economic.

In mountainous regions electricity is not popular for heating and, in addition, the frequent power blackouts make it totally non-reliable. Supply with pellets to distant villages is also a problem, since there are no local distributors and many people do not have the possibility to go to town for this.

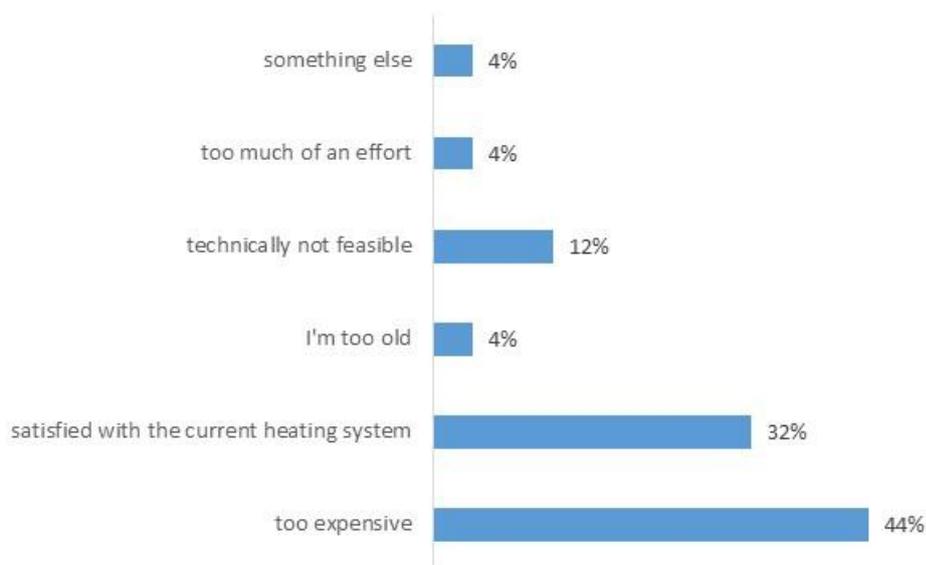


Figure 24: Barriers for replacing the current heating system with RES heating system

## Technological preferences

Two sources of alternative energy are mainly imagined for heating purposes: pellets and electricity (air-conditioners, convectors).

In the town of Kardzhali for example, where gasification is ongoing, many people expect to get covered by the network and switch to natural gas. Bad experience with irregular natural gas supplies of people who have installed individual natural gas systems, however shake the trust of consumers. Expectedly, the costs for the accession to the grid are also seen as a shortcoming.

Solar energy is considered by many as a promising technology but mainly for hot water supply. People report an increasing number of installed solar panels on the balconies of multifamily houses, e.g. in the town of Kardzhali.

Modern RES technologies are seen as inaccessible and expensive. One respondent shared that their family considered installation of a modern heat pump, however there was no supplier whom to trust.

In some cases, like for apartments in multifamily buildings, there are no technical options of choosing other heating than convectors or air-conditioners.

As regards district heating, local people do not have positive attitude. Many district heating companies, and units have seized operation and consumers were once forced to find other options. After having invested in such, the return back is not preferred, moreover that the price of the DH services are far higher than many other individual solutions.

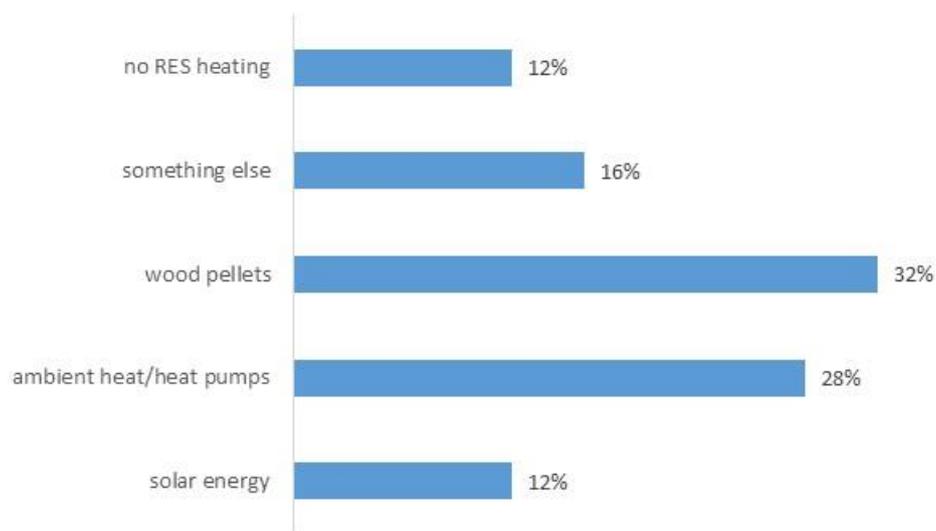


Figure 25: Preferences regarding RES heating technologies

## Benefits

The main benefits of switching from wood/coal and inefficient heaters to other heating sources stem from the identified disadvantages of the currently used technologies. Environmental benefits, the improvement of air quality, reduction of deforestation, better health conditions are considered as the most important ones. The improvement of individual heating comfort, seize of work-intensive servicing and maintenance are among the other major benefits.

### 1.7.2.3 Attitudes, channels and preferences

#### Information sources and channels

Most consumers use and prefer internet as an information source – “Nowadays, everything could be found on the internet”.

The other still very powerful source is the word of mouth. Friends, relatives, colleagues and neighbors usually set the direction... They give advice, recommend technologies, specialists, producers and distributors, showcase implementation of measures and share a first-hand experience.

Of course, TV and other media also develop consumers’ taste.

Another common “source” when choosing the heating source is the financial situation – in shop you buy the appliance that can fit your purse.

Most of the respondents say they look for information through the above mentioned sources and channels, but the final decision is always theirs. Only one interviewee mentions that when they start changing their system, they will consult specialists. One respondent, who has applied for an energy efficiency program credit, has bought the technology recommended by the bank. Elderly people usually consult their children.

### **Relation between climate-friendly systems and home value**

People agree that efficient climate-friendly heating systems increase the value of their homes. But it is not the economic value that matters so much. Most important for them is the comfort, the health benefits and the positive effect on the environment.

### **Criteria**

Generally, the criteria mentioned by the interviewees, stem from the disadvantages of the currently used technology.

The majority of the respondents would choose a heating technology that is easy to maintain and clean. Less spade-work, less soot, more hygiene and cleanliness, comfort, and peace of mind – these are what people would search for.

Given that heating is not on all day round to keep the necessary thermal comfort, respondents find it important to be able to warm up the space fast.

A group of people between 25 and 45 years old, concerned about the problems with air pollution and deforestation, point the environmental friendliness of the type of heating as the main criterion.

Price (or reasonable price) remains the most decisive criteria, especially in the case of elderly people and people raising children. This concerns not only the technology itself and its installation, but also the subsequent maintenance and fuel supply.

One respondent mentions his criteria being high energy efficiency, and another one talks about quality and correspondence between price and quality.

### **Arguments or issue that support the purchase of climate-friendly systems**

The most powerful issue that supports the switching to climate-friendly systems is the deforestation, which has become a major problem in our country, and the health issues caused by using different harmful fuels for heating purposes, which have come into focus of the public during the last couple of years.

As it has been pointed out already, the prevailing opinion however is that wood cannot be replaced by any other fuel, because it brings comfort, warmth, cozy and romantic ambience of home. Wood stoves usually serve for both heating and cooking, hence they save costs. Some people (elderly especially) believe that pellets are more expensive and even more difficult to serve. One of the respondents, who has applied to the municipal program for replacing of stoves and fuel is worried that pellets are delivered in large bags, which cannot be parceled out in order to take them to the upper floors.

### **Kind of information and means**

Desired information covers:

- ✓ financial possibilities (mainly gratuitous) and (national, regional, local) schemes for inefficient heating replacement,

- ✓ different types of energy efficient technologies available at more reasonable prices,
- ✓ already installed systems,
- ✓ fuel consumption according to the specific heating solutions and consumption profile (calculators).

Most preferred means of information:

- ✓ social media,
- ✓ events,
- ✓ demonstrations,
- ✓ e-mail.

## 1.7.3 Mindsets and interests of intermediaries

### 1.7.3.1 Overview

According to interviews with RES heating installers, households in the Rhodope Mountains prefer to switch mainly to pellets heaters, as most of them already have radiator installations at home that could be used. Pellets heaters are automatic, and help them decrease manual work in servicing their old heaters for wood or coal burning. Heat pumps are used less, as investment is much higher, and the region is characterized with cold and severe winter and nice temperature in the summer, with no need of air conditioning.

RES equipment is much more suitable for independent individual houses, where people can make their decisions alone. Barriers for investment in RES heating systems could be mainly the high investment cost and lack of finance, the inability to service solar collectors for boilers and frequent quality problems with these, negative experience from national programs that manipulated people and did not provide enough benefits, and also negative personal experience of people from low quality equipment not reaching the expected efficiency and saving results.

National programs in the field so far have been successful in different aspects but still have lots of weaknesses which need to be carefully reviewed and considered when designing new programs. In both cases, engineers that have worked for long years in the RES heating installation market, suggest to assist in the programs design so as to be more successful.

### 1.7.3.2 Fields of interest and general perception of consumer mindset

#### Major heating type used

People in the Rhodope Mountains traditionally use solid fuel for heating. There are no central heating suppliers. Gas for households is available only in Asenovgrad, a town at the northern end of the mountain close to the Thracian Plain. Gas for households is expected in Kardzhali in the next 2-3 years. Most people switch to pellets heaters in the region, as the fuel is cheaper than wood, easier to service at home and cleaner than wood. Individual cases purchase heating pumps, less than probably 2% of all, some installers reported 5% of all their clients, other reported just one case in the last year among all installations. Solar collectors for water heating are becoming more popular especially in the towns close to the plain, where temperatures in the summer are higher and investment is repaid fast. Some installers report that people also install electric heaters that also use radiator installation.

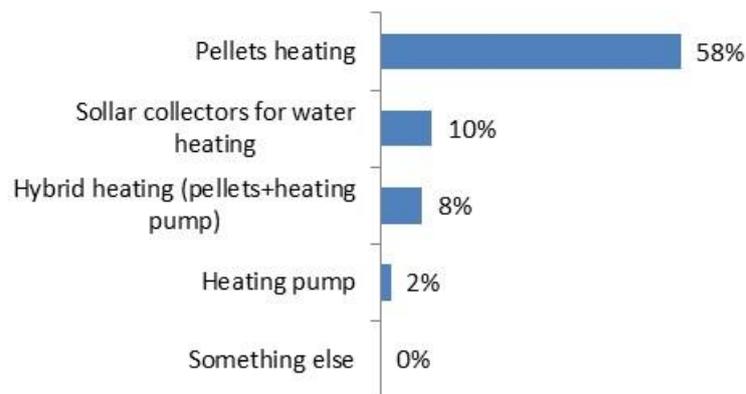


Figure 26: Main RES heating types installed

### Business scope of installers

Most of the installers interviewed for the purpose of this study report to sell mostly cheaper pellets heaters to people in the region. This is their major business scope for clients from the Rhodope Mountains. Several installers share the opinion that some 50% of the population is in process to switch to pellets heaters. Some of the companies specialize in heating pumps, others offer mostly solar collectors for water heating, and many of them have also more products with renewable energy to sell, but sales are much fewer.

### Reasons for switching heating

Regardless of type of new renewable energy people switch to, their main reasons for not being satisfied with old wood burning heating are as follows:

- ✓ Work-intensive heating, not easy to service;
- ✓ Wood is more expensive than pellets in the region, which is a large producer of pellets;
- ✓ Coal also became more expensive;
- ✓ Pollution is high, air pollution and also in-house pollution;
- ✓ Very old heaters were used, with lifetime of over 30-40 years, requiring replacement;
- ✓ Many households have radiator installations at home, and it is easier to just change the burning heater type and continue supply;
- ✓ Decreasing price of investment in modern renewable installations allowing for lower monthly heating cost;
- ✓ People still can afford improving their heating efficiency in order to decrease cost;
- ✓ “Word of mouth” is a great stimulus for switching heating to a better and more efficient one, when people see positive experience of others.

### Benefits

The main benefits for households switching to pellets heaters with radiator system is that they can decrease cost, decrease burden with constantly servicing the wood heater and instead have an automatic pellets heater. Investment is also the lowest among all other types of heating, varying between 2 500 – 3 000 BGN for a heater. In addition, pellets heaters do not require after-sales service, as does solar collectors. People need solutions without after-sales service, with no periodic diagnostics, with no additional servicing fees. People are not interested in the ecological parameters of the heating. It is all about cost, savings and comfort. Some installers mentioned that cheap pellets heaters are not energy efficient and not ecological, especially in the severe winter when the burning overpasses

standards and still creates pollution. Usually a pellet heater with remote/smart control and online connection costs twice, and some clients also mention the ability for remote control on the heaters in the winter. People can heat up the house before they go back home from work, or before going to their villas in the mountain on weekends.

New heating pumps with air-water technology are suitable in the region for the abundance of water springs, which solves the problem of frequent electricity shortages in the region. However, they are not so popular in the mountain, unlike all other big cities in the lowlands. Few people know that they can use running small rivers in villages in the mountain for air-water heating pumps.

Another benefit accounted for pellets heaters and heating pumps type “air-water” is the independency from central electricity suppliers. People want to be independent, and water and sun energy for household uses is a good alternative, but rather for cooperatives of several houses in areas with higher population density and favorable demographic trends.

Solar-based boilers are cheap, at around 160-180 BGN for installation besides the cost, which is different according to the supplier/producer, and would save money for heating water.

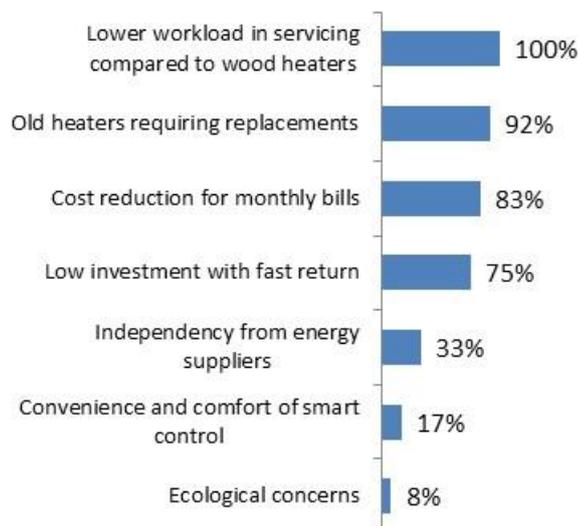


Figure 27: Main benefits to customers when installing RES heating

### Barriers

The main barrier for using solar panel/collectors for water heating is the difficult servicing of the panel. Technologies of cheap equipment are not developed yet to provide an automatic servicing. People have to climb to the roof and cover the panels when sun is strong, so as to have no their boilers exploding under the high water pressure. The safety valve is often discarded by the high pressure. The water pipes are stripped, eaten by the glares, and burst in the low winter temperature. In addition, sun in the evenings is limited in the mountain, and installations are not efficient enough in their supply. It is especially unsuitable for heating uses. Lower efficiency of solar-based boilers is also created by low investment cost preferred and low quality products purchased, that does not reach efficiency standards, and have lower saving results. This negative experience spreads among people, and many do not want to try because of negative examples.

Solar parks are not suitable for household uses, as there are no regulations concerning the sales of electricity to the grid from these. There is also no tax reduction for buildings with such installations. In addition, these require large space to install. If someone has enough space, then he needs to find

solution for energy conservation, which is important when you produce excessive electricity and are not connected to other users or to the grid. Batteries for energy conservation also require large space, and have lifetime of some 5-6 years, which makes it not good for investment. This type of heating is used in remote villas or caravans in areas with no access to normal electricity. Investment is also higher, at some 5 000 Euro per house, which exceeds the financial ability of most people.

Barriers for use of heating pumps in the region are high investment, low efficiency of the equipment during low winter temperature, no need of cooling in the summer, lack of support from the government, and frequent electricity shortages in the region during rains, storms and bad weather conditions. In addition, heating pumps are suitable for larger spaces, while old houses are small. Old houses have rather radiators in their rooms, but heating pumps are mostly installed under the flooring, which means major renovation cost. New houses are few in the region, mainly in the areas inhabited with Turkish and Pomacs, mentioned above. One installer reported to have met refuse from the government to put a heat exchanger of a heat pump in the nearby small river of a house, as being not ecological. Local municipality sees installation of vertical heat exchangers in the house as illegal and asks for permission from the Basin Directorate of the Ministry of Environment and Water, and does not see the benefits of stabilizing the core pylon of the house.

Negative experiences from national programs are also a barrier for people to participate. They have seen other households applying for grants for renewable energy to programs that require 10-20 thousands BGN for consulting companies, and after that they either receive small money instead or nothing, for which they do not trust European programs anymore.

Other barriers mentioned are the demographic trends. Many installers in the Rhodopes have actually closed their offices and moved to big cities, as population has decreased too much, and there is no room for so many competing companies.

### **Forecasts**

The process of switching heating to RES will continue as before in the next one year, although there might be some decrease in the installations for a few months, due to the coronavirus crisis and many people losing jobs not only in Bulgaria, but also in western Europe, with closed borders and inability to travel for short periods and undertake seasonal and short-term job that is enabling people to buy new heating installations. Some installers reported to have suffered a 50% revenue decrease since the beginning of the year, and forecast that the annual decrease may be better, at some 20% down year-on-year. The percentage of consumers that will change soon (within 1 year from now) their heating system will remain the same – the share of households switching to pellets heaters will continue to increase from 50% on, approximately, to more, with the same pace. Installers that heating pumps will remain low and solar collectors for water heating too.

### **1.7.3.3 Business, experiences, market and training**

#### **Size of investment**

- ✓ Pellets heater: 2 000 – 3 000 BGN just for the heater. Radiators are not included.
- ✓ Pellets heater with smart control: 6 000 – 7 000 BGN
- ✓ Heat pumps (mostly air-water type): at 10 000 – 15 000 BGN, going up to 20 000 – 30 000 BGN for good quality ones, or down to 6 000 – 7 000 BGN for locally produced pumps.
- ✓ Heat pumps tubes for flooring: 200-220 BGN/m<sup>2</sup>
- ✓ Geothermal heat pump with option for electricity supply: 80 000 - 100 000 BGN
- ✓ PV panels for electricity supply: 20 000 – 30 000 BGN
- ✓ Solar panel: 1 Watt=1 Euro, one house is 5KW or 5 000 Euro

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## **Negative & positive aspects of providing consumer with RES heat instead of traditional fossil fuels**

Positive aspects are numerous, listed in detail in the benefit part of this analysis.

Negative aspects of providing consumer with RES could be in the case of investment in low quality equipment that does not fulfill the expectations for return on investment. Rather, clients turn to pay even more for energy for their monthly bills. Installers are sometimes unhappy that people do not pay more money for higher quality heating. They also express disappointment about national programs that do not require quality standards and admit just selected companies to supply.

### **Services to customers besides RES heat: energy management and other**

People prefer to not use additional services, especially if these are paid. They prefer to not have any other additional burden. Energy management is used in the minority of cases, even if installers see this as a problem. Additional services are for more expensive equipment, and are preferred by fewer clients.

### **Knowledge of Demand Response programs and other programs**

The only programs that respondents **know** are Desiree Gas, LIFE and REECLE.

- ✓ Desiree Gas provided 30% grants for up to 2 400 BGN for gasification and installation of high efficiency boilers in households. The total fund was 2 million BGN. Advantage of the program is that the client could choose the supplier alone. Within the provided grant amount, the client would select more efficient equipment. Also, the financing was distributed through the gas company, which was in charge to arrange documents directly with the bank, avoiding commissions and any type of charges to the client.
- ✓ LIFE program – covers 6 Bulgarian municipalities. Sofia already purchased pellets heaters and distributed them to people's houses. It purchased the heaters at the lowest price with low efficiency parameters and let households pay for the labor for installment. Installation companies asked for higher prices in order to compensate the lack of profit from product sales.

When asked whether consultation is needed in order to make a decision for switching heating with RES, installers suggest that this is also a main factor for not switching, people usually are not aware of what type of RES will bring what type of benefits. In many cases this is very individual and specific, and installers believe that consultations in national programs would certainly help.

As for having a list of guaranteed suppliers, respondents prefer to have standards for the equipment and quality requirement, online management for pellets heater – and other specifications, which will limit the unfair selection process of companies for supply.

### **Channels of information about RES heating and cooling systems**

End-users that buy more expensive and efficient equipment visit forums online, in Facebook or other discussion platforms.

Positive experience of real person/house/RES equipment – is the best way to promote. Contacting local well-known installers are also the fastest way to spread good examples.

## **1.7.4 Mindsets and interests of large investors and project promoters**

### **1.7.4.1 Overview**

Builders are not much involved in the decision-making process for heating type, unless when they build multifamily buildings in the cities with large grids for supply of gas or central heating. In these cases they would prefer to install the relevant tubing or radiator systems needed for gas or central heating usage. However, there are numerous factors impacting their decision, such as the specific city and the specific local supplier of energy, price of the relevant energy source and households' attitudes toward the supplier. In any case, multifamily buildings have numerous obstacles for installing RES heating, which is not considered at all. If RES heating is concerned, only the spare house/apartment owners can decide on it, and find individual solutions.

In order to popularize RES use for heating in multifamily buildings, the government needs to make changes in the regulations regarding energy distribution, urban planning by heating type, review processes of construction permission approval and requirements for new buildings.

### **1.7.4.2 Fields of interest and general perception of consumer mindset**

#### **Region specifics**

An increasing number of building and investor companies have left the region, and operate now separate projects there from their headquarters in big cities, either Plovdiv, Sofia or even seaside cities such as Varna and Burgas. Builders in the region alone report to have left just 1-2 companies per town, compared to more than 6-7 in the near past.

#### **Heating and Business**

Building companies with projects in the Rhodope region are not in charge of the heating installations. They report that they just build the construction, the main house/building, and then they leave, and rarely care about the heating installation. Most of them have some observations thought, and in the big cities, where they build multifamily buildings, they even have decision making if the project is in an area with central heating grids or gas supply grids.

#### **RES Heating Installation Trends**

Builders, despite that they do not care of the heating installation after their work, are aware of the trends in the region, and report that most households have radiator systems and do not install heat pumps as they do not need to cool their homes. For instance, builders operating on a national level can compare this with households around the seaside, which install mainly heating pumps, for cooling in the summer. They also have more clients with the ability to afford more expensive and innovative installations, and in general are more positive about future trends, compared to installers.

Builders do not discuss heating installation with their households, and are not a source of information for any type of benefits, barriers for usage and other. They have just vague observations on the trends. Details on these are provided in the installers' section.

### **1.7.4.3 Business, experiences, market and training**

#### **Motivation to use gas/fossil fuels instead of RES**

In Bulgaria decisions about use of gas/fossil fuels instead of RES are determined by two major factors: the building type and the presence of centralized heating and gas grids. No matter of both, however, people have become increasingly aware that radiator heating the best comfort and microclimate. With radiator heating, the air movement is healthier; the transfer of microorganisms is minimized, as well as is the noise in the room. In general, building investors decide the heating type only in the presence of central energy distribution grids in the region. Otherwise, decision-making is an individual case, apartment by apartment, house by house. Details are as follows:

**Individual houses.** The energy source is determined usually by the size of the new house to be constructed. If it is a large house, investors prefer to combine several sources – heat pump “air-water”, solar collectors, and radiators heating. If gas is available in the neighborhood, they would certainly add a gas heater for the radiators. If not, pellets heater would be used. If the house is small, the choice of heating would be limited to pellets heater with radiators installations. Price of energy sources is not considered in the first case rather, it is a question of being independent in the supply and own diversified sources. In the second case price is a critical factor.

**Multifamily houses.** Investors in multifamily houses decide to use gas and/or district heating<sup>5</sup> only in the areas where such grids are available. There are 14 cities in Bulgaria with developed district heating (DH) grids, covering about 15% of the population, and much fewer cities have central gas supply grid, covering 3% of the population as of mid-2020. When building new houses nearby gas or DH grids, investors do not always invest into the necessary tubes or radiators installations inside the building for supply. In Sofia city nearly 90% of the new buildings next to DH grid would invest in radiator installations, while this would be for just 50% of the new buildings next to DH grids in the other 13 towns with developed grids. Factors that impact this decision are 1) the price of the heating, which is different for each city, 2) the quality of service of the heating accounting companies, an intermediary in the supply between producer and consumer, 3) the type of the installations in the buildings (horizontal vs. vertical) and all related problems to this which impact the households’ attitudes toward usage of DH. In the case of gas, which has now decreasing price and much fewer systematical problems that the DH grid supply has, investors would consider presence of installation as a plus. Buildings investors would consider use of gas or DH depending on the attitudes of local people towards the energy suppliers in the city, adding the investment cost and estimating the effect in the final building price and estimated sales. While in Sofia having access to those central grids is a big advantage for selling house, in Ruse and Varna it is not. Any other type of heating for multifamily houses creates burden for inhabitants. It is either difficult to service, or more expensive, or if high investment cost. Additional burden for choosing other types of heating in multifamily buildings is the way of sharing common building costs which is discussed below, in the part for cooperatives.

In Bulgaria, in the last 2-3 heating seasons up to mid-2020, the energy sources rank in the following ascending order, according to the annual expenditure per unit heated volume: 1) night electricity; 2)

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<sup>5</sup> District heating companies in Bulgaria burn gas and the heat carrier in most cases is steam, in fewer hot water.

gas propane butane; 3) eco briquettes; 4) coal briquettes; 5) pellets; 6) district heating. Cost per heated volume is also considered when choosing heating type for a certain building.

#### **Size of investment**

- ✓ Air conditioner: 3 300 BGN per apartment/house on average (1 100 BGN per room, 3 rooms)
- ✓ District heating: 2 000 BGN per apartment on average for radiators only, the heater station for the building is paid by the DH supplier and is not included in the investment of building constructors or consumers.
- ✓ Gas heating: 3 000 BGN per apartment on average just for connection to the grid, price varies with the distance to the grid.
- ✓ Vertical gas tube for building: 13 000 BGN

#### **Negative& positive aspects of providing consumer with RES heat instead of traditional fossil fuels**

As mentioned above, building investors have decision on the provision of heating only when connection to central gas or DH grids is concerned. In the case of RES, building investors leave this decision entirely to the apartment/house owners. Their observations are that there are mainly negative aspects in providing consumers with RES heat, and these are:

- ✓ Lack of any initiative among consumers in multifamily building to install RES heat;
- ✓ Imperfect regulation of the relationships between owners in multifamily buildings, imperfect Law on the Condominium Ownership Management in Bulgaria, which does not resolve numerous areas of problems;
- ✓ Imperfect regulations regarding the distribution of common building costs in multifamily buildings, each building can choose different methodology, different intermediary accountant, which creates great variances in the accuracy of distribution, fairness, and creates huge negative attitude towards shared energy sources;
- ✓ Lack of city planning for DH and gas grids, and relevant mandatory requirement for heating types for each area, depending on its proximity to grids or RES sources/options. This creates inefficient and irrational competition between grids themselves and between them and RES;
- ✓ Lack of long-term vision in the government regarding RES development.

#### **Marketing of building with DH – RES**

There are no multifamily buildings with DH-RES during this study. Builders of RES in individual houses can upload pictures of their innovative and modern solutions on their websites. They would all have websites. However, RES systems are promoted among clients by the Word of mouth. People see good examples, and ask for the supplier of the solution.

#### **Main barriers for the consumer to finally install a new heating or cooling system**

- ✓ Lack of finance to invest
- ✓ Lack of trust in the efficiency and return on investment
- ✓ Lack of government programs to support financing and distrust in the programs

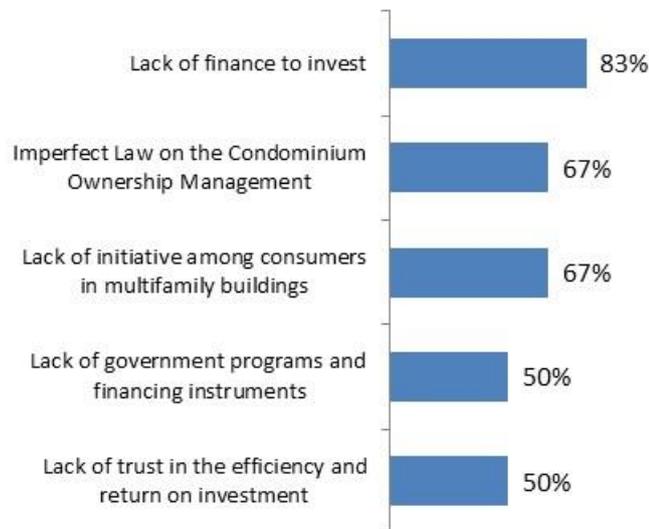


Figure 28: Main barriers for replacing old heating systems with RES

### Policy support at national and regional level

Respondents complain of the lack of policy support in the following aspects:

- ✓ Lack of preferential lower price for electricity needed to supply heat pumps (could be up to 2 hours per every 24h);
- ✓ Lack of legal right and financing for micro co-generators at electricity distribution companies to distantly switch off/on electricity supply from heating pumps;
- ✓ Lack of any stimulus for the end-users;
- ✓ Lack of any obligatory/mandatory rules for end-users;
- ✓ Decrease in the gas supply which will increase consumption and installations at households
- ✓ National programs providing any type of support for energy efficiency measures or change of heating type have numerous weaknesses described below in detail;
- ✓ Lack of requirements for quality certificate for the equipment (for instance this could be according to the Safety requirements provisions Article 36 – which can guarantee the equipment quality and efficiency, and compliance with state standards);
- ✓ Lack of simple application and approval process for national programs for heating replacement, heavy administration procedures and numerous documents required;
- ✓ Lack of special department with new 1-2 persons per region employed for approval of documents of applicants.

### Collective actions

Building investors see no willingness for collective distribution of energy, and think that this is one of the main barriers for RES in multifamily buildings. Bad practices in energy sharing of DH consumers so far have created huge negatives among owners in multifamily buildings. The law leaves owners to decide alone the methodology and the accounting company for heat distribution, making the choice too flexible and allowing for manipulation. At the same time, the law guarantees the cost payment to the energy supplier at the entry of the building, but does not care of the cost distribution after the building entry, and leaves options for heat thefts, which is a unique phenomenon and only shows the imperfectness of the market mechanism.

Multifamily buildings in Bulgaria are not juridical entities. If they were such, they could sign a contract with the energy supplier and then there are no intermediate companies (heating accountants) or legal methodologies for heat distribution. Then building owners can solve this between themselves.

Some respondents suggest that building investors are required by the government to declare awareness of the advantages and disadvantages of each heating type before issuing construction permission. Additional suggestion is the governments to set up urban planning by heating type, so as to have regulated installations, and avoid useless competition.

Associations of installers could be of help, but they need to include more representatives from the industry, and they need to popularize the benefits of RES heating, to defend more rights, regulations and standards for more efficient and quality equipment use at the relevant institutions. This will help decrease the grey sector, which currently exists and limits the development of bigger suppliers with annual expenses for state standards certificates. There are 2-3 associations so far, but they do not function well. They are not proactive and do not represent the rights of the companies well.

### **Channels of information about RES heating and cooling systems**

Building investors are not interested in heating installations when they build individual houses. Usually they do the construction of the building, and after them come the installers to set up the installations that are written in the project plan, as decided by the client. Building investors have no impact on the decision making and are totally not interested in discussing heating types. They have observations on what clients choose, and could provide some perception of the market trends, but they do not look for information about RES heating and cooling systems.

## **1.8 Croatia – North West Croatia and Primorje – Gorski Kotar County**

### **1.8.1 Main conclusions**

Three target groups (end consumers, intermediaries, and investors) were interviewed with the aim to collect opinions and experiences about renewable heating and cooling and to lay the groundwork for future activities within the project, such as developing engagement tools and regional replacement campaigns for different target groups. Interviews with target groups were conducted in May and June of 2020 and the participants are located in the North-West Croatia and Primorje – Gorski Kotar County, as well as the headquarters and/or branch offices of the institutions, which were part of Intermediaries and Investors target groups.

Importance of renewable heating and cooling for the future sustainable development of cities and regions is recognised in each target group. Additionally, all age groups of interviewees in the target group End consumers demonstrated satisfactory awareness of new technologies and other heating systems. However, the age group 30 to 45 years old showed significantly higher interest in replacing their existing heating systems than other age groups. This corresponds with the upward trend of renewable heating equipment purchases, observed by target groups Intermediaries and Investors, indicating that more and more consumers are considering replacement of their existing heating system.

Majority of the interviewed participants within target group End consumers live in urban areas (Zagreb, Karlovac, Rijeka), where district heating system and central heating system using natural gas prevail. On the other hand, households in rural areas are using more diverse energy sources and systems, such as firewood, pellets and in some cases combination of natural gas with solar collectors for hot water preparation.

All three target groups expressed a similar attitude towards the main benefits and obstacles of replacing the inefficient heating system and possible reasons behind discontent with the existing heating system. Financial savings and environment-friendly alternative are seen as main benefits for installing a renewable heating system, whereas large investment costs and technical difficulties to install a new heating system in households, especially in multi-apartment buildings using shared-chimney system (a large number of co-owners and split incentive issue), were perceived as major obstacles. The dissatisfaction with the existing heating system stems from high energy consumption and high fuel prices, which comes to the fore during the heating season.

Governmental support of renewable heating was described as inadequate and lacking due to low representation of renewable heating in subsidy models and public calls in comparison with renewable electric energy. It was agreed by target groups Intermediaries and Investors that it should be in the national interest to have feasible and reliable financing schemes in place, which would encourage citizens to consider updating their old systems and replacing them with the new ones. Given the national objectives in the field of sustainable energy and emission reductions, replacement of old systems with new ones through financial incentives, informative campaigns and knowledge transfer should be encouraged on national and regional levels. Interviewees often drew parallels with neighbouring EU states, where the subsidies for heat pumps and other efficient heating system are largely available. Target groups Intermediaries and Investors agreed that aforementioned obstacles could be addressed by implementing co-financing or subsidy models and programmes and continuously educating citizens, intermediaries and public servants, who can act as a bridge between policy-makers and end consumers. Marketing campaigns would be crucial to delivering the benefits of such a framework. However, they should include two-way communication and provide end consumers with additional information on the possibilities and benefits of renewable heating and how to include it in their household. These campaigns should educate users and be interactive so end consumers can appreciate the benefits of investing in a new heating system.

Information sources used by most of the interviewees, in all three target groups are online sources, professional literature, educational workshops and conferences organised by relevant institutions. Some of the companies in the target group Investors have educational showrooms on their premises which the interested end consumers, clients and installers can visit and find out more about available technologies and options of installing a specific system in their home. However, one of the mentioned issues by the target group End consumers was the information incoherence on web sites and the inability to find the necessary information in one place. For this reason, all three target groups expressed the need for one-stop-shop service, which should provide citizens with simplified information about the legislative proposals and current legislative framework, existing and new technologies, available subsidies, grants and credit lines for the replacement of the heating systems and other information which could be useful to a layman looking to replace their heating system.

## 1.8.2 Mindsets and interests of consumers

### 1.8.2.1 Overview

The original plan to host a focus group meeting and additional semi-structured interviews for a smaller group of end users/consumers had to be modified because of the protective measures issued due to the COVID-19 pandemic. Instead, telephone interviews and extensive online questionnaires were conducted.

The analysis of mindsets and consumers' interest included a wide range of age groups. However, the most prevailing age group were consumers between 30 to 45 years, making up 80% of the interviewed population. This age group was outlined by the target group *Intermediaries* as the group most inclined to replace their existing heating systems and switch to renewable heating due to the higher interest in environmental issues and home improvement, as well as access to sufficient funding for such improvements. Other age groups, such as younger than 30, 46 to 65 years old and older than 65 years were equally represented, constituting 7%, 7% and 6% respectively of the interviewed consumers. Distribution of interviewees based on the urban/rural segment of their place of residence is represented in Figure 30, which shows that almost half of the interviewees (46,7%) are from an urban area populated with more than 100.000 inhabitants.

Age group structure of the interviewees, as well as the distribution of the population urban/rural areas, are shown in figures below.

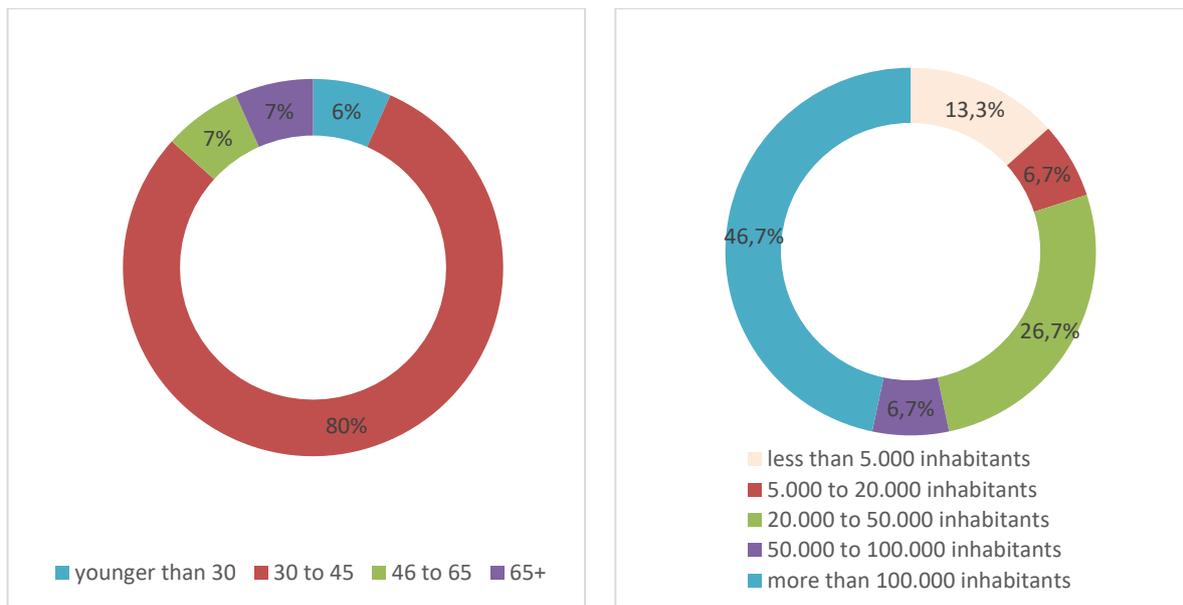


Figure 29 Age group structure of the interviewed consumers

Figure 30 Number of inhabitants in the place of residence

Most of the interviewees stated that they are familiar with other (including renewable energy sources) heating systems and new technologies and only 7% of the interviewees indicated that they are not familiar with other heating systems, as given in Figure 31. High awareness of new technologies and other heating systems among all age groups and especially in the age group 30 to 45 years old correlates with the statement by the target group *Intermediaries*, that this age group is most likely to participate in the replacement of inefficient heating systems and using renewables in their households.

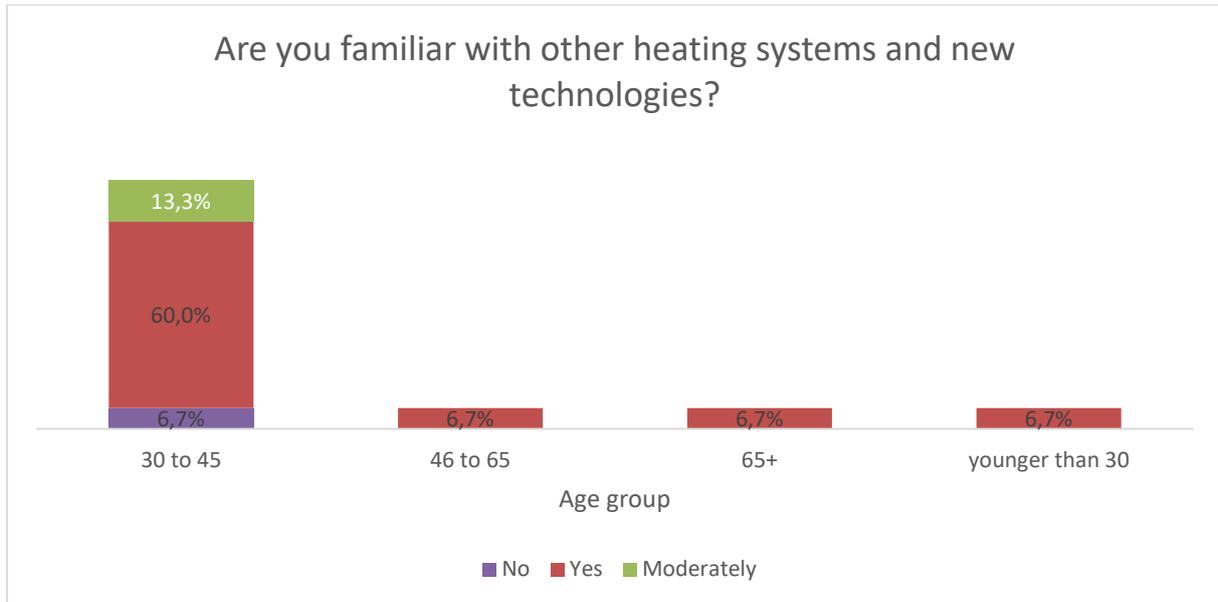


Figure 31 Familiarity and awareness of other heating systems and new technologies by age groups

Figure 32 illustrates the distribution of energy sources in different types of buildings, indicated by the interviewees. Multi-apartment buildings are commonly found in urban areas where the most prevalent heating energy systems are central heating systems using natural gas. Another heating system widespread in the target urban areas is a district heating system, which is common in Zagreb, Karlovac and Rijeka. On the other hand, households in rural areas are using more diverse energy sources and systems, such as firewood, pellets and in some cases combination of natural gas with solar collectors for hot water preparation.



Figure 32 Heating energy sources or systems in different house/building types

## 1.8.2.2 General benefits, barriers, concerns, and expectations

### Main benefits of replacing an old heating system with a renewable system

For this part of the interview, interviewees could choose between multiple answers on the benefits which would incentivize them to replace their old heating systems and their cumulative answers are given in Figure 33. Contributing to climate and environmental protection was chosen as the main benefit of the replacement (86,7% of the interviewees), whereas related benefit *alternative to fossil fuels* ranked significantly lower (26,7% of participants chose this benefit as relevant). Potential financial savings also ranked high with 73,3% of the participants opting for it, however, government subsidies were not considered as enticing and were ranked in the last place, with 26,7% of the participants opting for it. Almost two-thirds of the interviewees consider the independence of rising energy prices as a benefit, and for a third of the interviewees' constant energy supply is of importance when analyzing the possibility to replace an old heating system.

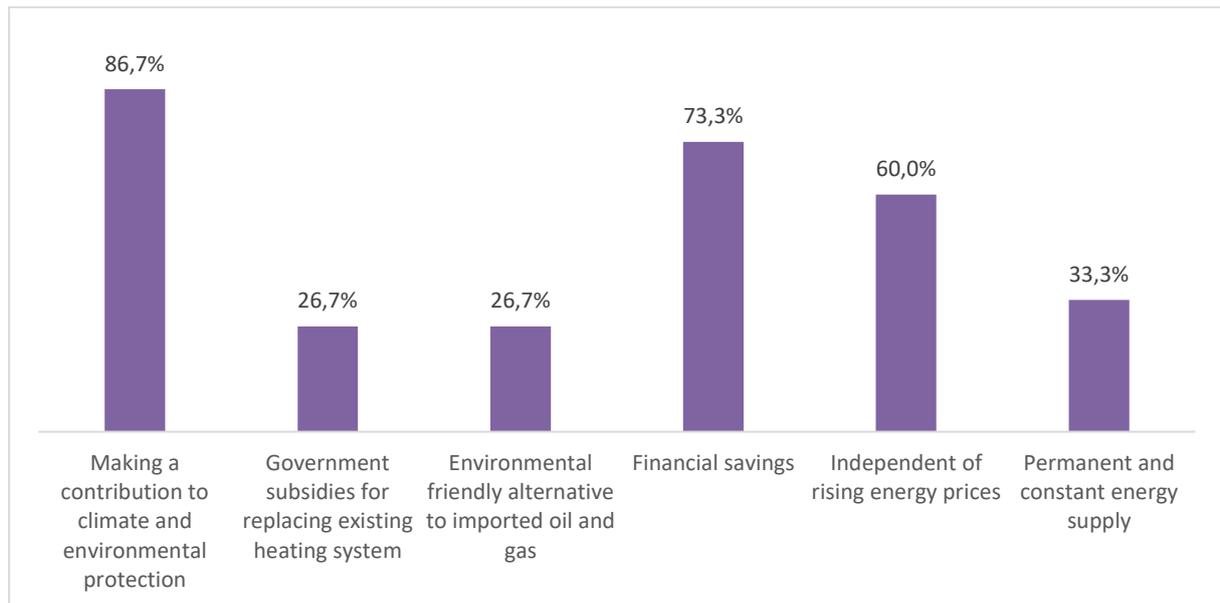
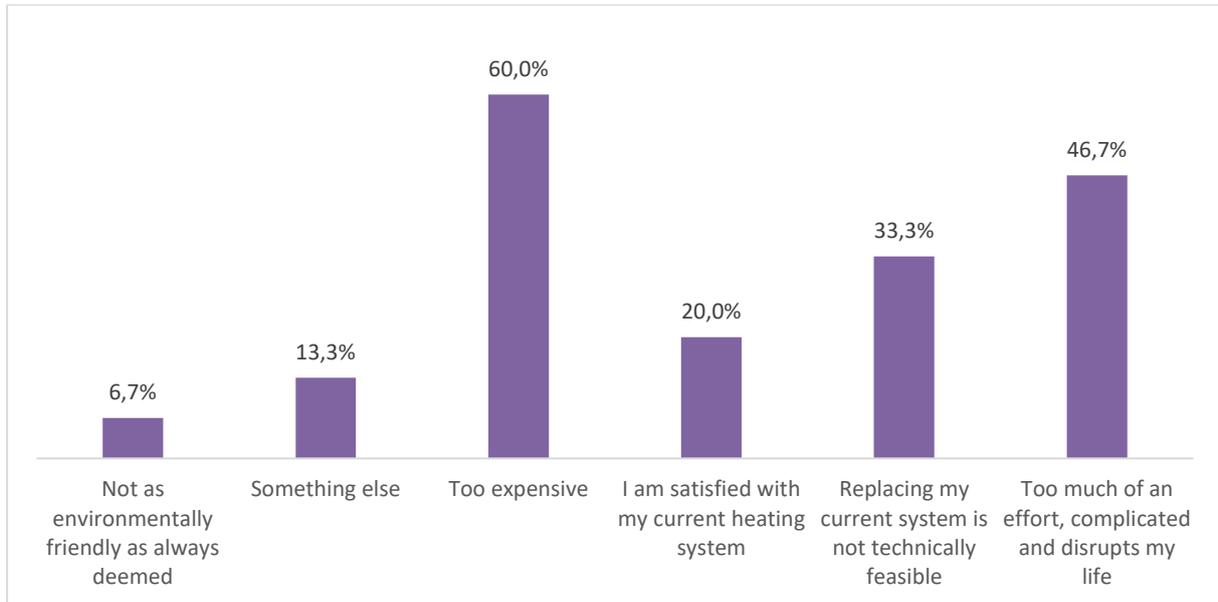


Figure 33 Main benefits of replacing an old heating system with a new, renewable system

### The main barriers to replace an old heating system with a renewable system

A major obstacle encountered by the end consumers when considering replacement of old heating systems with a more efficient one is high investment costs and expensiveness of the system and related works. This obstacle was brought up by 60% of the interviewees, whereas 46,7% interviewees pointed out that the replacement would require too much effort and it would disrupt their daily life. Third of the interviewees reported that heating system replacement is not technically feasible in their homes, as they live in multi-apartment buildings and are connected to the shared chimney system. Only 20% of the interviewees are satisfied with their current heating system and do not need to replace their heating system. A minority of interviewees, 6,7%, is doubtful about the environmental benefits of new heating system, which highlights the importance and necessity of continuous education in this area, as well as providing customers with the opportunity to participate in workshops and share their doubts with an expert in this area.



**Figure 34 Main barriers of replacing an old heating system with a new, renewable system**

Although most of the participants indicated that they have sufficient knowledge of renewable heating systems, 80% of the participants pointed out they are not planning to replace their heating system soon, and therefore are not considering possible renewable heating sources. Participants planning heating system replacement are mostly considering heat pumps, pellets and solar collectors for hot water preparation as new renewable heating sources.

The main reason behind discontent with the current heating system is the unfavorable climate footprint (60% of the participants), which coincides with the participants' opinion on main benefits of replacing an old heating system with a new one (Figure 35). The second most mentioned reasons were high fuel prices and high energy consumption, to which 40% of the participants agreed. Third of the participants pointed out difficult regulation of space temperature and excessive greenhouse gas emissions as another reason behind dissatisfaction with the current system. Other reasons behind not being completely satisfied with the current heating system are system taking up too much space in the room, repair costs, inadequate system capacity and safety of the system.

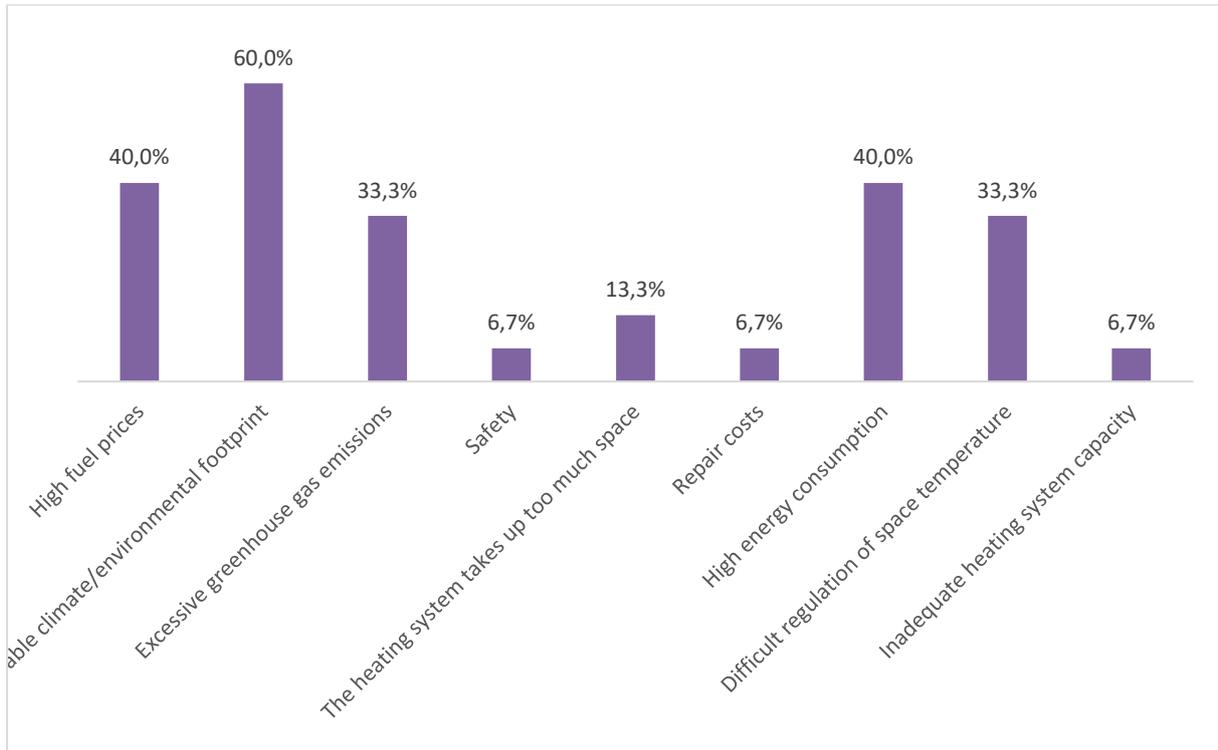


Figure 35 Reasons behind dissatisfaction with the current system

Majority of the interviewees do not plan to replace their heating system soon, although only a fifth of the interviewees expressed satisfaction with the current system. Obstacles for it are given in Figure 34, and in Figure 36 is given a share of planned replacements in relation to the share of heating cost in total utility costs. Interviewees whose heating cost is between 30 and 50% are most likely to plan heating replacement, as well as those who cannot estimate current heating cost (20% of the interviewees). However, the majority (80%) is not planning to replace the heating system soon and their heating costs range from less than 10% to 50% share in utility costs. Additionally, some of the participants replaced their heating system in the last 10 to 15 years and are not considering replacements.

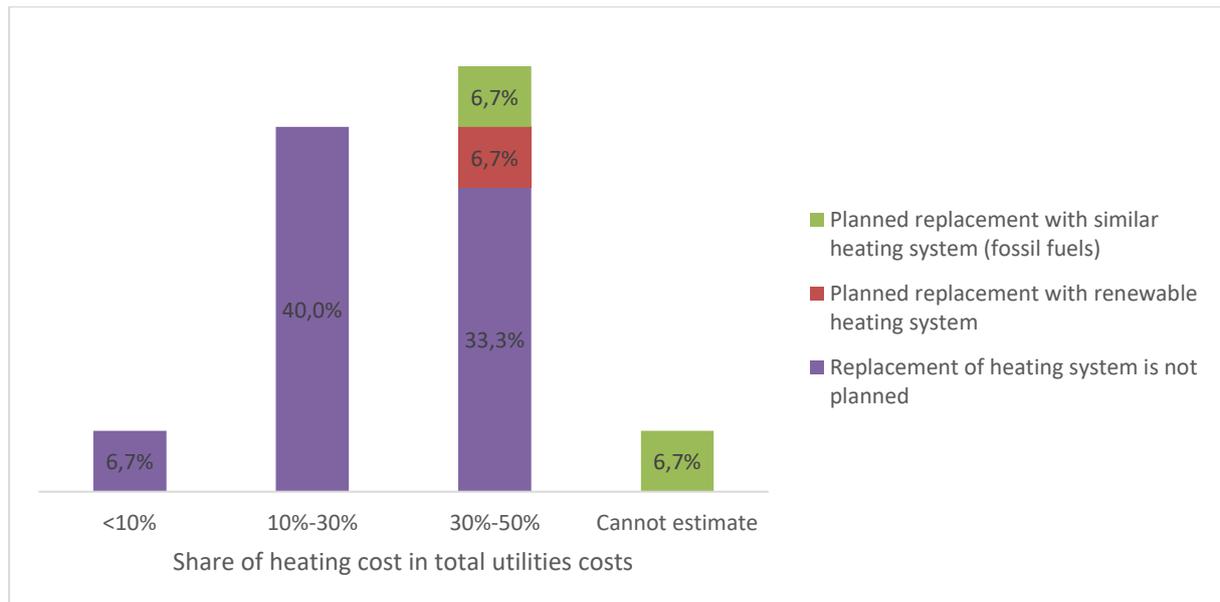


Figure 36 Planned replacements in relation to the share of heating cost in total utility costs

### 1.8.2.3 Attitudes, channels and preferences

#### Positive and negative aspects of heating for the consumer

Consumers connected to a local district heating system (DHS) pointed out the dependency on the heating season of their heat supply company, as a major negative aspect, which prevents them to regulate the temperature in their apartments at any given time. The heating season usually lasts between 15<sup>th</sup> of October to 15<sup>th</sup> of May and the heating in the apartments can be turned on only in that period. Additional negative aspect mentioned by the DHS consumers is the age of the system and associated technical losses, which causes pipe damages and higher energy costs in the long term.

Additional negative aspect mentioned was finance aspect, covering high energy prices on one end, especially if the building is not energy renovated, and the expensive purchase and installation of the heating equipment on the other end. As the majority of the participants uses fossil fuels, another concern was the negative impact on the environment.

Consumers in the multi-apartment buildings using the gas central heating system in their building mentioned the low level of optimization of the system, as a negative aspect, causing the unequal distribution of heat on different floors and apartments.

One of the most often mentioned negative observations from the consumers living in the multi-apartment buildings, as opposed to the consumers living in the family houses, was the inability to make any changes on the heating system on their own and having to get the approval from other co-owners. This observation does not concern only the heating system in the building, but also all other mutually-owned shares. However, independence from other entities was quoted as one of the positive aspects from the house-owners point of view.

The simplicity of usage and a high level of comfort was one of the most often mentioned positive aspects of the heating systems. Ease of use of the heating system was further reflected in the possibility to connect the heating system to smartphones and regulating the temperature. Another positive aspect mentioned is carefree maintenance of the system in the multi-apartment buildings using central heating systems, where the maintenance is done by the external company and the tenants are usually

not aware of the maintenance regime and the apartment is heated on the push of the button or in this case a turn on the thermostat.

Reliability and efficiency (technical and economical) are highly ranked on the consumers' expectations list, as the main objective is to satisfy the heating demand of the building at the lowest possible cost. Other expectations include safety (for protecting human health and life and security of energy supply) and flexibility (available when the consumer needs it).

In the long-term, some of the interviewees from urban areas mentioned expectation to switch to district heating systems using waste heat and renewable energy sources, whereas those from rural area are opting for locally available energy such as biogas, biomass and solar energy implemented in individual or centralized heating systems. However, such major transitions are not expected soon, due to the heat energy prices being set by the energy regulator, making it difficult to invest in energy efficiency and renewable energy sources.

### **Information sources and channels the consumers use**

Majority of the interviewed consumers do not think about their heating systems often or regularly. Changing the heating system or making some changes to the system are usually considered during the heating season when the heating bills arrive, when the heating system maintenance is due, when considering larger home adaptation or when the neighbors in the building start making some changes on their heating system.

Information sources used by the majority of the interviewees are various web sites, such as news portals or the websites of equipment manufacturers and heat supply companies, as well as conversations with neighbors and family members. Interviewees working in the energy sector think about their heating systems more often and use professional literature such as journals, magazines, as well as attending various conferences where more information can be obtained. One of the interviewees mentioned attending educational workshops organized by one of the leading equipment manufacturers, which proved to be very useful and on point. Tenants of the multi-apartment buildings usually talk with the representative of the co-owners in their building regarding the heating systems and possible changes, as well as the family member or colleagues at work if they are working in the energy sector.

Often mentioned issue with the information sources was the information incoherence on web sites and the inability to find the necessary information in one place. Interviewees in the age group 65+ are more inclined to using TV and radio as an information source, as well as consulting with the family members and with the building's representative of the co-owners.

### **Expected services by public independent services**

Interviewees believe that establishing an independent one-stop-shop service would be highly beneficial but are unsure how it would work and attract people. Such services should provide citizens with simplified information about the legislative proposals and current legislative framework, existing and new technologies, available subsidies, grants and credit lines for the replacement of the heating systems and other information which could be useful to a layman looking to replace their heating system.

Participants pointed out that clear, detailed and transparent information on energy and technology prices, ideally including external and additional costs are needed. No clear consensus was reached regarding the dilemma between public and information source, although the majority of the interviewees is leaning towards public and independent information source.

Interviewees pointed out the following aspects, which could be helpful in the process of informing and selecting a more environmentally friendly system:

- Transparent and easy-to-access subsidies without unnecessarily complicating the process of application, evaluation and verification of distributed funds,
- Automation and digitalisation of the subsidy distribution process,
- Affordable, fast, convenient, and correct installer and maintenance service,
- Accurate and verified information in the media and other news outlets, including informative TV features and shows.
- Legislative proposals and framework which would address split-incentive issues and issues with the co-owners of the building uninterested in any improvements of the mutually owned parts of the building,
- Legislative framework which would regulate chimney sweeping services on the national level,
- Manuals for “dummies”, with step by step guides and relevant information written in terms understandable to a layman,
- Updated investment calculator to have at least a basic idea how much would the investment be.

### **Experiences with intermediaries**

Chimney sweepers and maintenance services are considered the most relevant intermediaries and as such were given a slight edge in comparison with other intermediaries. One of the often-mentioned criticisms on behalf of the intermediaries are stark explanations, occasional sloppiness, and a lack of correct information, which is often combined with the motive to sell additional and sometimes unnecessary service. Such behaviour causes scepticism from the consumers’ aspect and the lack of trust towards intermediaries. Information received from the intermediaries is usually taken with a grain of salt and evaluated based on the further conversation and the impression certain intermediary leaves.

Interestingly, none of the interviewed consumers mentioned any positive experience with any of the intermediaries. Answers usually ranged between slightly negative experiences to neutral and indifferent sentiment towards intermediaries. Half of the interviewees trust installers and maintenance services, whereas the other half of the participants are on the fence about trusting the intermediaries or are completely distrustful due to earlier negative experiences. Participants expect quality service from their intermediaries, which includes fixing the breakdown, not imposing unnecessary works and offering a guarantee for the performed service, as well as suggesting potential heating alternatives. Potential additional services offered by the intermediaries, which would be beneficial for the end consumers include proactive approach, keeping a record of the heating system maintenance so they can call the consumer and remind them of the upcoming maintenance instead of consumer thinking about it, offering additional information on the alternative systems, simplifying long and complex documents and processes, suggesting what can be done to improve the efficiency and reduce costs and similar activities which could be helpful to the end consumer.

### **Consumers’ perception of heating system replacement and using climate-friendly systems**

As previously mentioned, interviewed consumers think about their heating systems mostly in the heating season when the heating bills arrive or when the heating system maintenance is due. However, even in those times, interviewed consumers are reluctant to change the existing system for many reasons. For the participants living in the multi-apartment buildings, the first thing that comes to their mind when thinking about boiler replacement is the technical feasibility of it. All apartments in the building share heating system and before making any changes to the system majority of co-owners have to agree to proposed changes, which is often a struggle. Another thing that comes to mind is the difficulty to change the heating system during the heating season without compromising the home comfort.

Heating bills usually range between 20 and 50% of other utility bills and the principal cause for such difference is the energy isolation of the building/house and the interviewees heating habits. Participants who replaced their heating system recently or are thinking about a replacement, indicated that they did not or will not install some version of renewable heating. Although they are aware renewable heating would be beneficial for them in the long term, technical difficulties and/or higher investment costs are considered main obstacles to go forward with such investment. Furthermore, the lack of time for researching alternative optimal solutions was also mentioned as one of the setbacks.

Just under half of the interviewees agreed with the premise that installing climate-friendly systems would increase their home value and a majority of those who agreed to live in the urban areas exceeding 100.000 inhabitants, although some of the interviewees from smaller urban and rural areas also agreed with the premise and this is shown in Figure 37. Interviewees who were hesitant about the possibility of home value increase mentioned that the location of the building/house still plays a decisive role in determining real estate price.

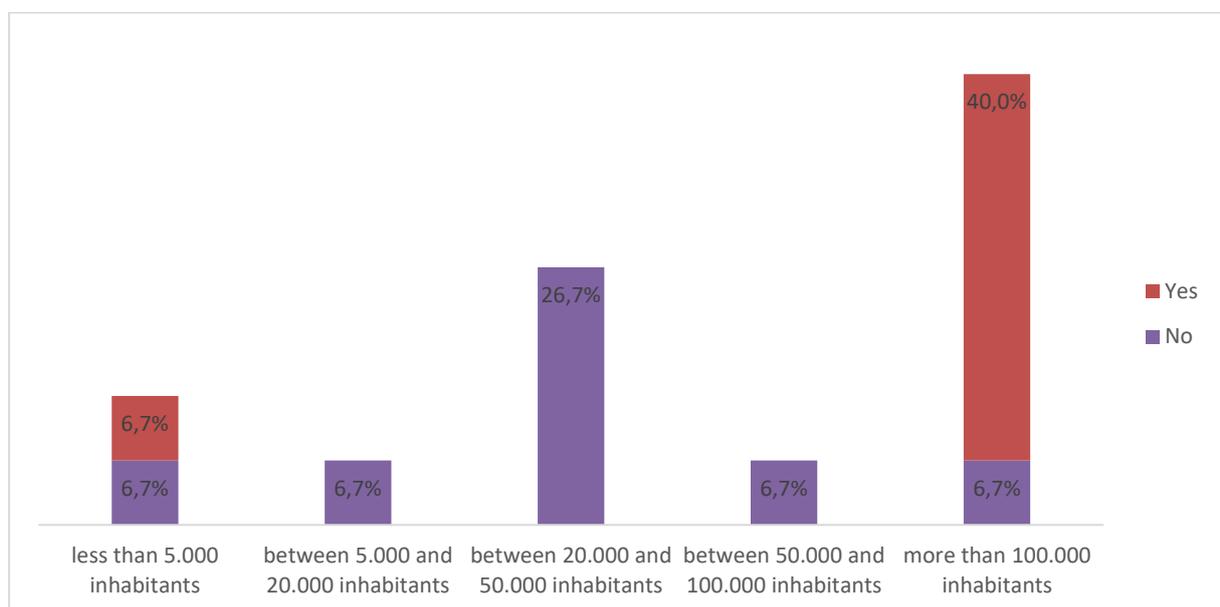


Figure 37 Increase of home value if the heating system is replaced based on the urban/rural area

### Awareness of renewable heating technologies

Interviewees are aware of the renewable heating technologies and their benefits but due to higher investment costs, they are reluctant to replace their current heating systems. Besides the financial aspect, other criteria to select certain (renewable and/or efficient) technology include technical feasibility in their home, availability of the necessary information, and to a lesser extent energy efficiency of the new heating system. Based on their current knowledge and available information and if they could choose a different heating system, interviewees would opt for heat pumps and solar collectors as individual heating systems or district heating system using waste heat, geothermal energy or other renewable energy sources. Interviewees living in multi-apartment buildings have divided opinions on connecting to the DHS if such an opportunity would arise. Those who are in favour of DHS believe that DHS is the future of heating systems in densely populated urban areas, whereas those opposed are reluctant due to its lack of flexibility, i.e. turning the heating on and off is done centrally and cannot be controlled by the individual.

### Arguments against switching to climate-friendly heating systems

Main arguments against switching to more environmentally friendly heating systems are lack of credible information, the structure of fuel and energy prices in Croatia, technical capabilities of the building and additional investments related to the modification of heating surfaces in case of the low-temperature heating. Low and regulated energy prices in Croatia provide no incentive for the end consumers to switch to more efficient systems, whereas tenants in the multi-apartment buildings are often “victims” of split-incentive issues. However, the majority of the interviewed participants believe the energy prices will only go higher in the future. Although many of the participants underlined financial burden on their family budget as one of the main reasons against replacement, a great majority of them are uncertain about the actual costs of the replacement and how much it would strain their budget. Situations like these only emphasize the need for the information and educational campaigns, as well as tools, which would provide credible information to citizens.

## 1.8.3 Mindsets and interests of intermediaries

### 1.8.3.1 Overview

Interviews with the intermediaries were conducted during May and June and included a wide range of representatives of various intermediary companies and associations. These included chimney sweepers associations, energy advisers, energy cooperatives, heating system installers and building management companies. Share of each intermediary group is shown in the figure below.

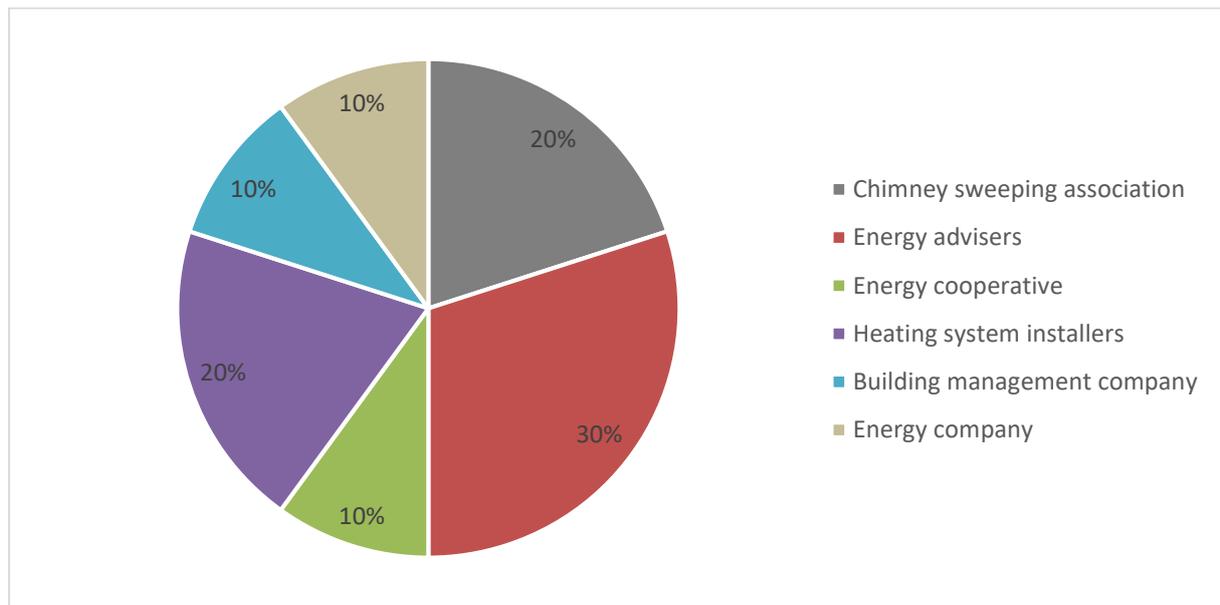


Figure 38 Overview of interviewed intermediaries

### 1.8.3.2 Fields of interest and general perception of consumer mindset

Majority of the interviewed intermediaries is not directly involved in renewable heating and cooling sector, but are associated with it through different segments: management of the buildings, installing heating and cooling systems, chimney sweeping or advising interested citizens on RES potential and possible implementation in their homes. From that perspective, energy advisers and energy cooperatives expressed their interest in all RES areas with a slight advantage given to solar energy, RES heating installers are more interested in heat pumps and other intermediaries did not express any preferences on working with a specific RES.

Similar to the findings of the end consumer's interviews, intermediaries see financial savings and environment-friendly alternative as main benefits for consumers who install a RES heating system. Besides these, security and safety of the consumers using the heating system also plays an important role, as seen from the intermediary's position. According to the intermediaries, the dissatisfaction of consumers with the existing heating system stems from high energy consumption which in combination with the high fuel costs leads to soaring energy bills in winter months. Another often mentioned reason behind the annoyance with the existing heating system was the inability to regulate the room temperature to end consumers' needs.

Often mentioned barriers for the consumers regarding the replacement of their old boiler with a renewable and/or more efficient system include costly investment with a long return period, complicated replacements, technical difficulties but also lack of good neighbourly relations in multi-apartment buildings. Another "barrier" mentioned is consumers' satisfaction with the existing heating

system or recent replacement of the heating system. Additionally, gasification of urban areas and in large part of rural areas, combined with the low gas price in Croatia for households creates the perception that investment in a renewable heating system is not a financially feasible decision. Consumers are usually prompted to consider replacement during winter months or when faced with expensive repairs and the inability to replace the boiler (gas central heating) with the same model due to new eco-design regulations. Replacing the classic gas boiler with the condensation gas boiler requires chimney adaptation, which is a substantial investment on top of the new boiler purchase. Additionally, to replace a single classic gas boiler in one apartment in the multi-apartment building, every boiler connected to the shared chimney system, to which the boiler to be replaced is connected to, has to be replaced at the same time regardless of its state/condition, which leads to dissatisfied tenants and aversion towards heating system replacements or upgrades. Therefore, it is difficult to predict the share of consumers who will replace their existing heating system, especially with the COVID-19 and possible subsequent financial crisis. However, installers highlighted a steady upward trend of installing new and more efficient heating systems, especially in the heat pump segment. This claim indicates a further potential rise of purchased renewable heating systems but remains difficult to determine exact share. Experience of energy advisers in the field has shown that the combination of incentives and subsidies, reliable and accessible information motivates citizens to invest in their heating systems.

### **1.8.3.3 Business, experiences, market and training**

#### **Positive and negative aspects of heating for the consumer**

Scope of work of energy advisers and cooperatives largely encompasses RES related topics and from that standpoint, efficient and RES heating systems provide more benefits for these stakeholders, as well as for the installers in the heat pump segment, due to higher capital values and margin. Chimney sweepers stated that more benefits come from the traditional fossil fuel heating systems, as these are generally more profitable, due to market share in comparison with the RES heating systems.

Chimney sweepers associations pointed out issues with pellet heaters in combination with the existing chimney systems in the buildings, which occur due to inadequate connection of the pellet heater with the chimney and often hampering normal combustion. Additionally, low fuel quality in biomass and pellet heaters, as well as lack of understanding and instruction on how to use the biomass heating system are an additional cause of difficulties in maintaining the chimney system. Such troublesome experiences with renewable heating systems do not provide a positive perception of renewables and as such, it is considered as a negative aspect. However, it was mentioned that the lack of trust towards RES from the consumer's perspective is usually not observed.

Heating system replacements are more likely to be done in family houses, where the owners can replace the heating system without seeking neighbour's approval, which is not the case in the multi-apartment buildings. For that reason, multi-apartment buildings are not usually found at the forefront of implementing new technologies. However, building management company representative mentioned a few multi-apartment buildings in their portfolio, which have invested in renewable systems for hot water preparation and electricity generation. However, there is only a scarce number of such buildings and those are usually buildings with a surplus in the building's cash reserve and with the majority of tenants open to new ideas and interested in going forward with such investment.

For energy advisers, numerous positive experiences outweigh the negative experiences with end consumers and the public sector. Lack of awareness on the available technologies and the individual impact each consumer has on climate change are counted towards negative experiences. Previous experience has also shown that NIMBY effect can be a decisive factor for consumers when large heating system replacements in cities are considered to be installed.

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## **Barriers for the consumer to install a new heating or cooling system**

Large capital investment is seen as one of the major obstacles for the end-users, as well as the discrepancy between wishes of the consumer and technical capabilities of their household. Another barrier for implementing new and efficient heating systems is split incentive and reluctance of other homeowners in the same building and connected to the same vertical chimney system to replace and/or update their current heating system. However, it was pointed out that solutions with lowest initial costs are not necessarily preferred by the citizens; depending on their income and awareness of the different heating system, end consumers tend to reach for the more expensive solution if it means having technical specifications more suited to their needs.

From the chimney sweeper perspective inadequate renovation of the chimneys, especially for the homeowners who are replacing their old gas boilers with the more efficient, condensing boilers is seen as a difficulty. Chimney renovations are often not properly implemented, which becomes problematic when chimney sweepers come to inspect boilers and chimneys and cannot provide homeowners with the permit to continue using the boiler.

Interviewed intermediaries believe that to address these obstacles it is important to implement co-financing or subsidy models, especially for the households with lower financial resources and work on continuous education of citizens, intermediaries and public servants acting as a bridge between policy-makers and end consumers.

### **Policy support at the national and regional level**

After the devastating earthquake in Zagreb on the 22<sup>nd</sup> of March 2020, many homeowners have suffered damage to chimneys, gas installations and heating systems. This situation has led to prompt measures imposed by the government to financially support homeowners to replace their old gas boilers with the more efficient condensing gas boilers. The total fund allocation amounts to 41 million HRK (ca. 5,4 million EUR) or up to 8.000 HRK (ca 1.050 EUR) per household.

Despite this hefty amount dedicated to chimney renovations and improving gas installations and heating systems in residential buildings in the area affected by the earthquake, it was highlighted multiple times during interviews that the policy support at the national and regional level is inadequate, especially in terms of renewable heating and chimney sweeping regulations. Decree on chimney sweeping activities is defined by each local government separately, leading to the inconsistency of the scope of activities between cities and municipalities and causing lack of uniformity on the national level. Associations of chimney sweepers started the activities of advocating the need for harmonising the chimney sweeping regulatory framework on national and extending it to local level but these activities are still in the inception phase and waiting for the approval by the ministry in charge of it.

Another remark on renewable heating was its inadequate representation in subsidy models and public calls in comparison with renewable electric energy. Although public calls for energy renovation of houses and multi-apartment buildings included the installation of efficient heating systems as an eligible activity, such activities were usually omitted from the final project plan due to large investment costs despite the subsidy. From that position, it is considered vital to have feasible and reliable financing schemes in place, which would encourage citizens to consider updating their old systems and replacing them with the new ones. The prevailing opinion on this topic is that the state, given its strategic objectives in the field of sustainable energy and emission reductions, should encourage the replacement of old systems with new ones through financial incentives, informative campaigns and knowledge transfer.

A one-stop shop is generally considered an efficient solution and an idea to encourage and facilitate not only the replacement of heating systems but also for the implementation of other measures in the

sustainable energy area. This way, end-users could make their choice easier and reduce the number of steps needed to replace an existing system with a new one. Additionally, it is necessary to consider further activities to facilitate preparation and implementation of renewable heating systems, possibly on a turnkey basis or collective actions. For successful implementation of collective actions, local community engagement is crucial, with energy cooperatives and local governments leading the way and showing by example.

### **Cooperation between stakeholders and possible future activities**

Strong collaboration between intermediaries is seen as an important aspect of project development and interviewed intermediaries are aware of it. Intermediaries working on RES project development, such as building managers, energy advisers and cooperatives, stated that they are already cooperating with other relevant stakeholders in different project phases and as a part of the project development process. Equipment installers also stated they have established communication and work together with energy advisers and energy auditors.

When questioned about knowledge of other market professionals, the majority of the interviewees agreed that others tend to have sufficient knowledge and information about RES systems. However, a concern was raised that some of the professionals are pushing their equipment and new technologies on consumers, without prior educating them about different solutions. Although in the short-term it results in a sales increase, in the long-term, it is not beneficial for end consumers who are not aware of different options.

Intermediaries are heavily relying on trade and professional literature and online available information to advance their knowledge of new technologies and advancements in the heating sector. Additional sources of information are also conferences and workshops organized by the professional chambers or equipment manufacturers. These cover many topics related to certain intermediary's profession, but also include heating-related subject matters. Some of the interviewed intermediaries are also implementing various RES projects, through which they gain knowledge and connect with end consumers and other intermediaries. Interviewed participants would like to extend their knowledge on new technologies, advancements, the legal and financial framework of the RES, whereas the chimney sweepers association prefers thematic conferences and workshops on fireplaces and flue chimney systems and ventilation systems because users often come to them with questions about it and they would like to help them with advice.

Nowadays, not many homeowners and project designers include chimney renovation in energy renovation plans and projects, which often causes significant problems for the homeowners in the post-renovation period. In such cases, the issue is solved by drilling holes for air supply, which often results in deteriorated visual appearance of newly renovated building. The essential tool for reducing side effects of the incomplete energy renovation is continuous education of not only end consumers but also of project designers and engineers. Educational and dissemination activities should be performed through professional chambers and associations, study visits but also using interactive channels such as social media, workshops, media etc. Professional associations supporting the RES systems should be supported by the national and local government in promoting RES systems and educating interested stakeholders. Additionally, the government should design financial models for economically viable renewable technologies and encourage its implementation.

## 1.8.4 Mindsets and interests of large investors and project promoters

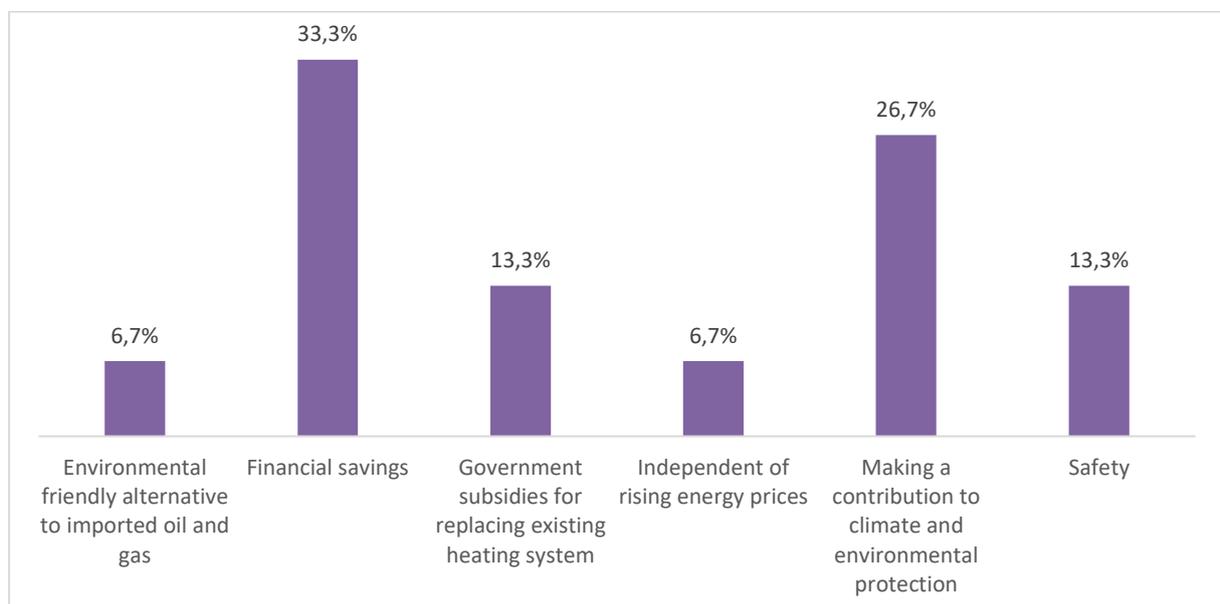
### 1.8.4.1 Overview

Target group large investors and project promoters included representatives of large equipment manufacturing companies in Croatia. Companies included in the interviews are either national or multinational companies, operating in the EU and worldwide in the heating and cooling sector.

### 1.8.4.2 Fields of interest and general perception of consumer mindset

The focus of the majority of the interviewed companies lies in the heating and cooling sector with few companies being also active in other industry areas. The sector of renewable heating and cooling represents only a share in their manufacturing portfolio, and the manufacturing of heating equipment which uses natural gas and/or other fossil fuels as energy source remains active due to the market demand. Companies tend to be mainly oriented towards manufacturing and installing heat pumps and other efficient heating systems (mobile container boiler rooms, condensing gas boilers). However, firewood, wood pellets and solar energy remain represented.

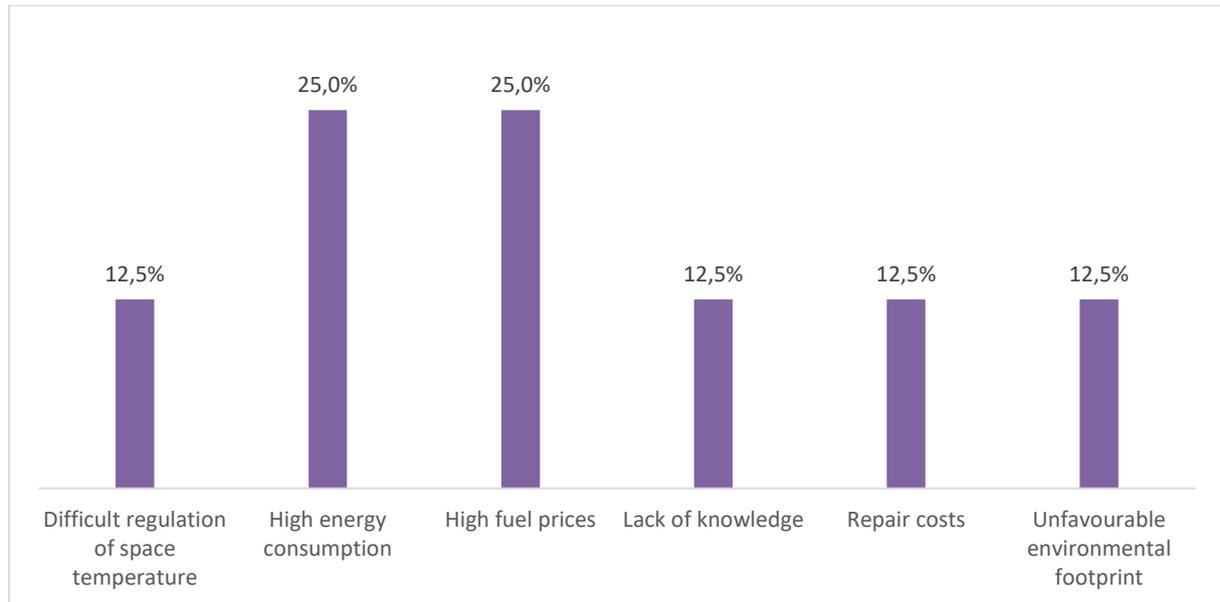
As with other two target groups of end consumers and intermediaries, financial savings are seen as the main benefit of replacing the existing heating system, as seen in Figure 39, followed by the benefit of contributing to climate and environmental protection. Other benefits include government subsidies, the safety of the tenants due to the new and improved systems and the environmentally friendly alternative to imported fossil fuels.



**Figure 39** Main benefits of replacing an old heating system with a new, renewable system as seen from the equipment manufacturing companies' perspective

According to the companies' representatives, there is an abundance of reasons behind consumers' dissatisfaction with their existing heating system – two main reasons being high energy consumption of the system and high fuel prices, as seen in the figure below. Other reasons include maintenance costs, unfavourable environmental footprint, difficult regulation of room temperature if connected to a central heating system and lack of knowledge, which was also mentioned as one of the obstacles.

Lack of knowledge refers to the lack of consumers' awareness of the new system benefits gained in the long-term and therefore it is identified as one of the barriers from the companies' perspective.



**Figure 40** Reasons behind dissatisfaction with the existing heating system as seen from the equipment manufacturing companies' perspective

Despite the high number of perceived barriers and reasons against heating system replacements, it was commonly agreed that more and more consumers are rethinking their existing heating system and considering replacement. Although the interviewees could not foresee the share of consumers changing their heating system in the short-term, it is believed that due to greater consumer awareness, the share of consumers opting for the renewable heating system will increase.

### 1.8.4.3 Business, experiences, market and training

#### Motivation to use RES

Interviews gathered a wide range of companies, from companies whose large part of the portfolio consists of biomass and pellets boiler to companies which dropped out of their portfolio biomass and pellet boilers due to lack of profitability. However, majority of the companies see heat pumps as the future of the heating systems, despite its relatively long investment return period. As the interviewees are large national and multinational companies, their business is not focused solely on one consumer group – households, industry and commercial estates are equally represented. With the rising number of outdated heating systems in the households, one of the remarks was that it would be beneficial for the consumers if the companies would manufacture high-temperature heat pumps, resulting in smaller initial investment for the end consumers.

Although fossil fuel systems are more widely spread and have a larger market share, renewable heating systems are believed to have greater future potential. Manufacturing of more complex and new technologies can be more expensive due to higher R&D costs, however, after the technology is fully commercialized and put on the market, costs drop significantly.

One of the companies with the focus on the cooling sector stated that fossil fuel systems are very rarely used directly in ventilation/air conditioning systems so they increasingly use renewable energy sources instead of conventional fossil fuels mostly use other energy sources.

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## **Positive and negative aspects of providing the consumer with RES heat instead of traditional fossil fuels**

The positive aspect is that the progress in the RES heat knowledge and awareness of an average consumer is visible in comparison with recent years, resulting in the increased numbers of inquiries about renewable heating systems.

Negative aspects are mostly related to the initial contact with tenants, especially in large buildings where the issue of split incentives is quite noticeable. Even in cases when the company was offering a discount or additional benefits for the building, they often experienced rejection from a group of tenants and a hostile environment. Nevertheless, such issues were usually solved before the project ended. Other negative aspects were not observed because most of the companies included in the interviews do not have direct contact with the end consumers as they operate only wholesale side of the business and do not have retail stores. Communication on most projects takes place with partners from the profession (B2B) - designers, equipment buyers (installers) and investors, while contact with the end customer is somewhat rarer and is primarily related to offered services. Companies are not considering expansion to other areas apart from expanding their current portfolio offer, e.g. wholesale and rent of container boiler rooms. Despite this, multinational companies tend to work hard on acquiring new customers by offering a wide range of additional services, such as regulating energy consumption using a mobile application, extending guarantees of the appliances, etc.

### **Marketing of renewable heating and cooling systems/Education of end consumers**

A lot of information for potential customers is available on companies' websites and some of the interviewed representatives have educational showrooms which the interested end consumers, clients and installers can visit and find out more about available technologies and options to install a specific system in their home. Some of the companies are also active on social media sites where they regularly update consumers on new products, technologies and upcoming campaigns. One of the latest campaigns which the majority of the companies promoted was related to governmental subsidies for the replacement of old gas boilers with the new condensing boilers for the households affected by the earthquake.

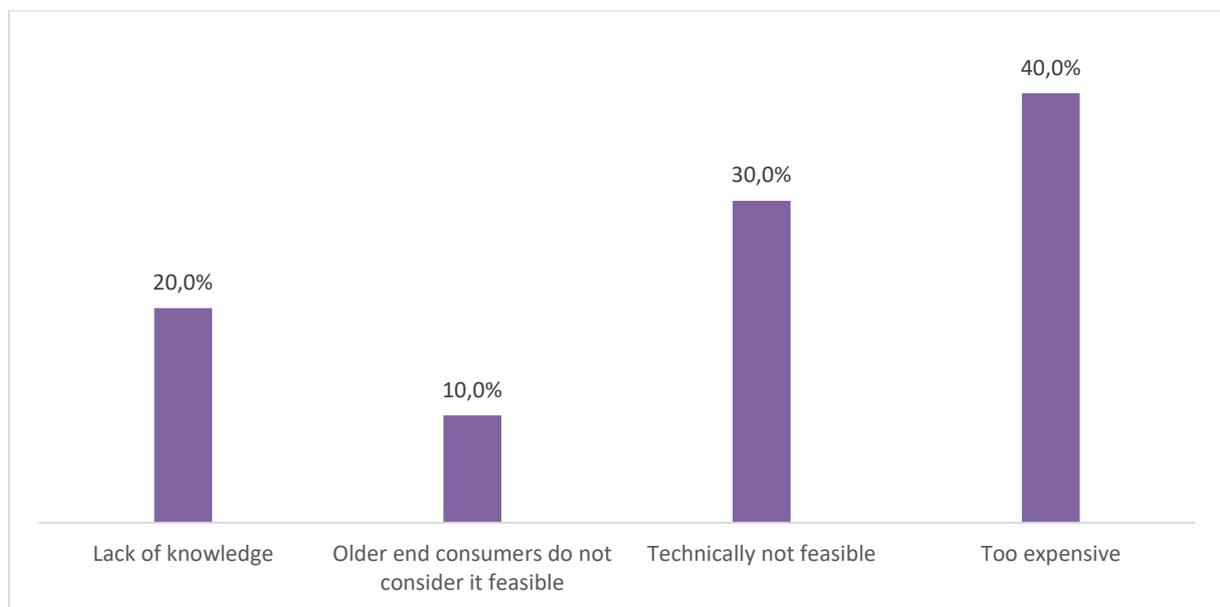
For the installers of their equipment, some companies are regularly organising workshops and training events to educate the installers on the equipment specification, as well as the installation know-how. Interviewed representatives find this to be one of the crucial segments, which indirectly leads to building better customer experience. Organising seminars and training events for installers can be perceived as a mitigation measure against potential high maintenance and repair costs due to improper handling with the equipment.

Aside from website and educational showrooms by some manufacturers, marketing activities related to the company's offer of RES heating and cooling systems are performed through conferences, sales representatives, study visits for prospective clients. Open door days at the distributors' premises was also mentioned as one of the good practice examples, where the interested installers and clients can find out more about the technologies. Companies also use various media channels, from newspapers, magazines to indirect TV adverts. However, probably the most influential marketing activity remains word of mouth.

On the other side, interviewees stated that they learn about RES heating and cooling through conferences, fairs, clients who often approach them and ask whether they have certain technology, cooperation with research centres and professional literature. Multinational companies operating in Croatia mentioned that most of the information on new technologies is received from their company's headquarters.

## Barriers for the consumer to install a new heating or cooling system

Based on the experience of the companies' representatives and despite financial savings ranked high on the benefits list, the main barrier for the replacement of an old heating system for an average end consumer remains high investment costs, as seen in Figure 41. Similar to the findings of the end-consumers interviews, companies' representatives have also experienced that technical prerequisites for the installation of the renewable heating systems often cannot be fulfilled, leading to an additional barrier. Technical issues usually occur with chimneys and shared chimney systems, prolonging the installation period and causing consumers to feel negative towards the replacement already in the first phase. Furthermore, hydraulic balance is not adequately done in some buildings, causing issues for the tenants and contributing to the negative feeling towards a specific heating source.



**Figure 41 Main barriers for replacing an old heating system with a new, renewable system as seen from the equipment manufacturing companies' perspective**

Cheaper heating systems are usually sought by the consumers replacing the existing system. However, consumers moving into new homes, preferably low-energy homes, tend to invest more as they think more about the future. Another barrier is lack of awareness and knowledge on the wider scale, as many are still reluctant about investing in the heating system, which in long-term could save energy and money. Additionally, consumers are usually not aware that to achieve energy savings integral energy renovation is required, which includes thermal insulation of the building but also the replacement or upgrade of the heating system.

Other barriers which were indirectly mentioned by the interviewed representatives were long procedures and substantial administrative procedures for subsidies, in cases when the consumer decides to use subsidies and postponing the investment if it is not crucial and the price of the system will drop in few years.

### Policy support at the national and regional level

Although it is believed that regulatory framework favours RES, most of the interviewees agreed that this is not necessarily the case for renewable heating systems and that additional measures should be undertaken to acknowledge the importance of the renewable heating systems in the energy transition. Current subsidy levels are considered insufficient for the present demand, which is reflected in the rapid allocation of available funds from annual public calls for the co-funding of the renewable heating systems in residential buildings. Interviewees often drew parallels with neighbouring EU states, where

the subsidies for heat pumps and other efficient heating system are largely available, resulting in the increased number of households heating and/or cooling their homes using heat pumps.

The use of RES heating and cooling systems in the residential sector could be accelerated by structuring and implementing a national programme with clearly defined objectives, dedicated financial support for beneficiaries and with the subsidies available all the time and not only during certain periods, i.e. duration of a public call. In such case, administrative procedures should be minimized to enable greater absorption of the subsidies. Such national programme should be supported by local governments, energy agencies and other relevant stakeholders who would through joint action complement implementation of the programme. It is necessary to approach this problem using the bottom-up method with end consumers being the focal point of the programme. Another possibility to promote renewable heating could be collective actions, in which the interviewees are generally interested.

The marketing campaign would be crucial in delivering the benefits of the implemented activities. However, it should be thought through, as many end consumers, at least the ones more likely to replace their heating systems, already have basic information so the campaign should also provide additional, detailed information to paint a clear picture for the end consumer on the possibilities and benefits and how to include it in their household. These campaigns should educate users and be interactive so end consumers can realise why they should invest in a new heating system instead of a new car. However, such a campaign should not be a one-off event, but a continuous one where the two-way communication would be encouraged and end consumers would be given the opportunity to regularly hear and learn about new technologies and opportunities coming from it.

## **1.9 Germany – Bavarian Oberland**

### **1.9.1 Main conclusions**

Bringing together the interests of consumers, intermediaries and investors has the logical challenge that intermediaries and investors like to make business and consumers like to make the best deal.

The interviews revealed that the attitude of the consumers towards sustainability plays an important role when it comes to decide about a new heating system. An information scheme in which consumers feel to being informed in a fair way is very important. Intermediaries and investors could make use of that by establishing a public forum, in which the stakeholders have the chance to come together.

Collective Actions were perceived positively by consumers and investors, however not completely by the intermediaries. Here, open communication about this social organisation form should be considered. Sustainable measures like Demand Response should be disseminated more, so that at least the professional sector knows what potential lies in that measure.

The main issue identified that stands between a fossil fuelled heating system and a sustainable one is clearly the financial situation. What seems to be missing on this field is information. Consumers need to be informed more comprehensively, but also in a transparent way. If the pure heating costs would be shown together with life cycle costs, then for example district heating is an economic solution with often satisfied consumers. Of course, information includes also the dissemination of public subsidies so that all sectors can benefit most.

## 1.9.2 Mindsets and interests of consumers

During April and July 2020, 14 different consumers were interviewed about their perceptions regarding a replacement of their heating systems. The interviewees answered 47 questions, the first five of them used as general ice breaking questions. The answers do not allow a statistical statement, however they can contribute to a broader picture of interests of consumers in the region.

### 1.9.2.1 Overview

The interviewed consumers revealed that they've got a general interest in sustainable heating systems. Most important for the interviewees were the financial aspects. What most of the interviewees further wished were independent and personal consultation that informs transparently about the cost-benefit consideration. The possibility to have a public independent service was considered positively.

### 1.9.2.2 General benefits, barriers, concerns and expectations

As mentioned above, each interviewee started the survey with five ice breaking questions, which could each be answered by choosing multiple answer options:

Almost all (13 of 14) interviewees answered that for them the main benefit of a heating system replacement would be *to make a contribution to climate and environmental protection*. More than half of them (eight of 14) added that they wanted to be *independent from rising energy prices* and that they see such replacement as *environmental friendly alternative to imported oil and gas*. While three interviewees also stated that with a sustainable heating system they want to *ensure a permanent and constant energy supply*, two interviewees answered that an *appropriate funding from the state* also is a main benefit for them. Figure 39 illustrates what this would mean in percentage values.

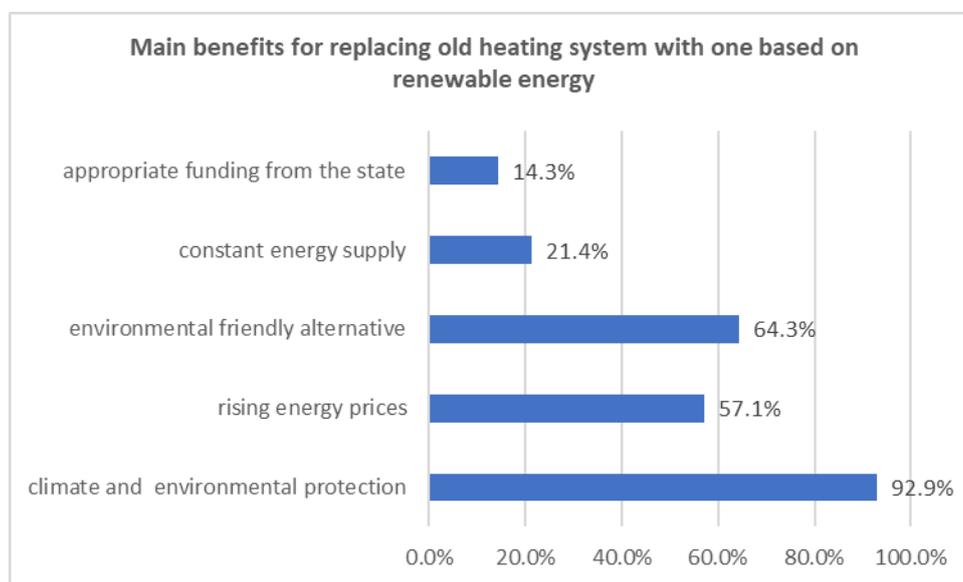


Figure 42: Main benefits for replacing old heating system with one based on renewable energy (possibility to choose multiple answers)

Half of the interviewees answered that a **main barrier** for replacing the heating system for them has financial reasons (*Too expensive, I don't have the necessary budget for it*). Four interviewees stated that they are satisfied with the current heating system. It was stated twice, that a replacement of the current system is *technically not feasible*. It was also stated that the *financial burden related with a heating system replacement is considered as too high (2x)* and that the *circumstances of a system*

replacement (dirt and noise) are too complicated. One interviewee stated that there are no barriers for a heating system replacement. Figure 40 gives an overview about the answers.

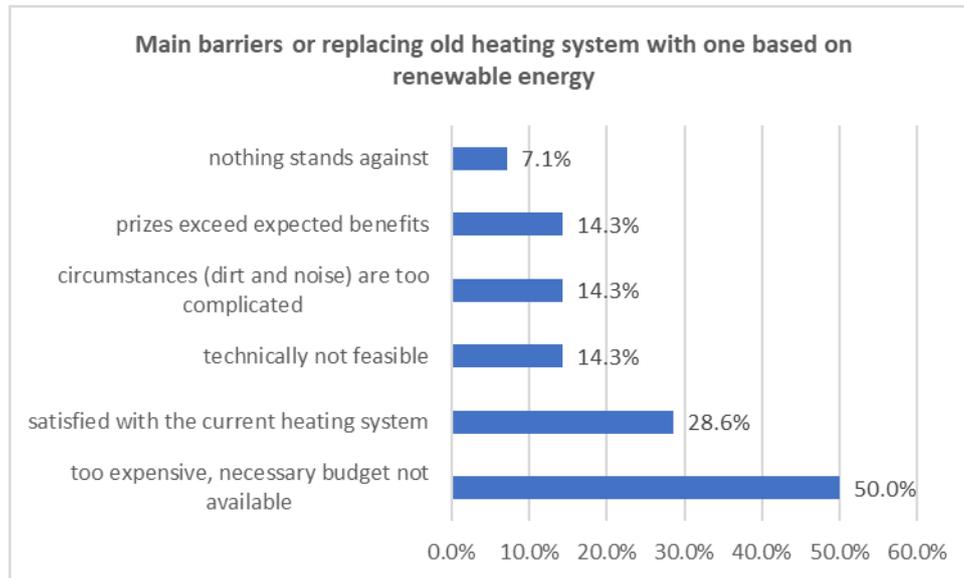


Figure 43: Main barriers for replacing old heating system with one based on renewable energy (possibility to choose multiple answers)

Being asked about the preferred form for the heating purposes, five interviewees preferred *district heating or a local biomass heating grid*. Another five favored solutions using *fire wood, wood pellets and/or wood chips*. One interviewee could imagine *solar energy* as future heating fuel.

Figure 41 shows, that half of the interviewees answered to be not completely satisfied with the current heating system because of a *bad climate/environmental footprint*. Two interviewees each stated that either the *high energy consumption, high repair costs or technical failures* are reasons for not being 100% satisfied. One interviewee answered that the heating system is *too loud*.

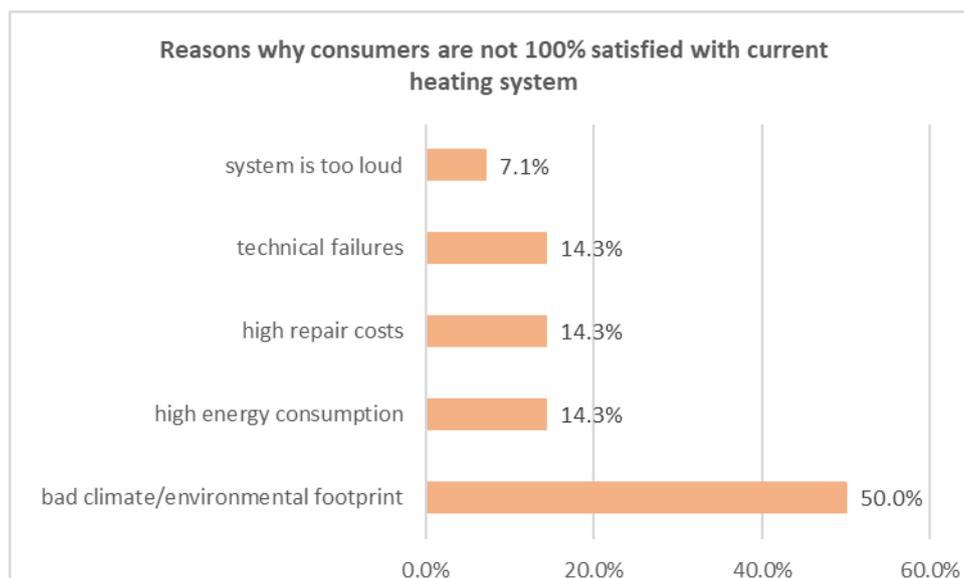


Figure 44: Reasons why consumers are not 100% satisfied with current heating system (possibility to choose multiple answers)

While eight interviewees stated that they plan to switch to heating with renewable energy, five others planned to replace the heating system, but to continue the use of the current fuel, which is fuel oil,

coal, natural gas, electricity, log wood, else. One interviewee has already an up to date heating system (see Figure 42).

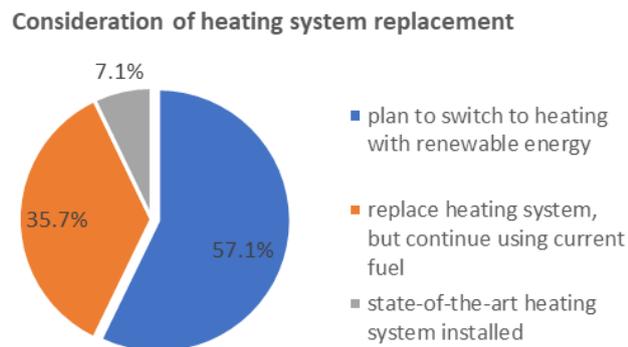


Figure 45: Consumers plans about heating system replacement

### 1.9.2.3 Attitudes, channels and preferences

Out of 45 different questions, which the interviewees answered, the following ones seemed to be of most importance to find out more about the attitudes and used information channels and preferences for the latter. Following, the answers are presented in a concise form:

Most of the interviewees (eight of 14) associated the personal wellbeing as positive aspect of heating. In contrary, nine stated as negative aspect that heating systems are bad for the environment and/or have high CO<sub>2</sub> emissions. Three interviewees identified the costs as negative aspect, and one interviewee had a critical view towards the dependency on international energy producers (i.e. co-financing of undemocratic states or governments).

Two interviewees could only see positive aspects when imagining heating with wood or clean energy.

Most of the interviewees, 11 of 14, stated that they used *information from the internet*, when they wanted information about heating systems. Four revealed that they contact *energy consultants*, and only one each tried to get information directly via a *chimney sweeper* or a *installer*. Further information sources mentioned were *newspapers (1)*, *expert discussions (1)*, *technical articles (1)*, *producers (1)* or *friends (1)*.

To the question whether any negative or positive experience has already been made with installers or maintainers, four interviewees stated to have made *neither nor, or not yet*. One interviewee has made *positive and negative experiences*. Rather *positive experiences* were stated once and twice *energy consulting* was mentioned as positive experiences. Once, also dedicated *positive experiences with installers* were stated.

Rather negative experiences reported that installers would only try to make a good business for themselves (1), they were considered as biased (1), or not being interested in energy saving measures (1). Once, general negative experiences with installers and heating companies were made by an interviewee.

Five times, the *costs for a new heating system* were mentioned. Three times each, *dirt* in the house and the challenge to *find the right system* were spontaneous associations. Twice mentioned was a *better energy efficiency*, and once each were reported *noise, renewable energies, wood pellets, climate*

protection and the wish for an *uncomplicated replacement*. One interviewee was an *owner of a heat pump* and thus had no reason to think about a boiler replacement.

Eleven interviewees believed that a climate friendly system would *increase the value of their home*. One stated to *not see a considerable increase* of the home value, one *doubted* that there would be any increase, and one has *already a new system* (groundwater heat pump). This clear opinion can be seen in Figure 43.

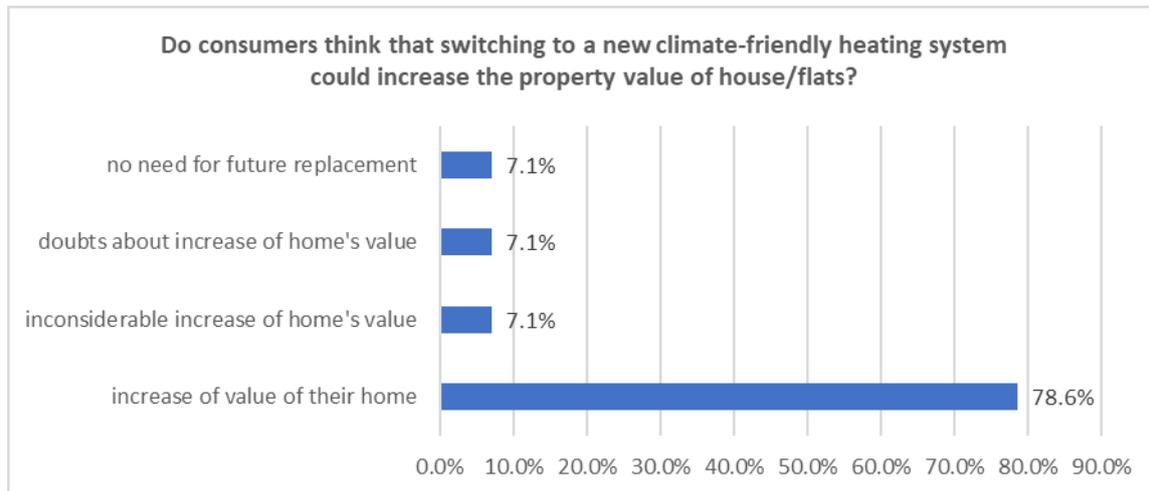


Figure 46: Consumers' opinion whether switching to a new climate-friendly heating system could increase the value of their homes

The main criteria to select a certain technology were the *costs*, either *generally* (3 times) or mentioned as *cost-benefit criteria* (3). Five times, sustainability aspects were mentioned, in the form of *renewable energies* (2), the *environmental balance and climate protection* (2), and the *availability of a sustainable energy carrier* (1). Twice mentioned were *expert opinions*, and once each reported were *facts*, *technical feasibility* (i.e. a simple heating concept) and a *connection possibility*.

The main argument against switching to a climate friendly heating system were (*time and*) *costs* (seven of 14). Four times, it seemed that *fear of change* played a role, as the interviewees stated that learning something new is an argument against (2), what they have is already proven, or that *the new is unknown*. Twice reported were *doubts about the reliability* of a new system and a *general lack of knowledge*. Once each stated were *dirt*, *space*, *unclear value and habit*.

Two interviewees did not see any argument that stands against switching to a climate friendly heating system.

The majority of interviewees see a public independent service *positively* (11), two of them emphasizing that they expect a *really independent consultancy*, and two others that they would like to have a *recommendation of technologies*. One interviewee was *not sure* what to expect, and one was *skeptical* about the assessment of independent consultants.

Not surprising, the answers about kind of information and means of them were varying a lot. What seven interviewees stated as most important for them, was an *independent consultation*, specified in some cases to be connected with a *technical recommendation* (2), *realistic economical information* (2) or to be just *concisely*. Two interviewees expressed how the information should be transported, more via *social media* (1) or generally more via the *internet* (1), *exhibitions and articles* were also mentioned. Moreover, once each mentioned was information about a concrete date for the *phase out of heating oil*, tools that respect *data protection* completely and installers who present a *packaged solution*.

## 1.9.3 Mindsets and interests of intermediaries

### 1.9.3.1 Overview

For the intermediaries, the main benefit for the consumers would be the independence from raising energy prizes and the maintaining of a sustainable attitude, however, in contrary, dissatisfaction with high energy costs does seemingly not play a major role among the consumers.

The revealed workload ahead for the intermediaries showed that they have enough work in the future. As it is known, that in the region, there is a lack of skilled workers, the main barriers to install a renewable eating system are then missing workers and the financial aspects for the consumers. It should be analysed, whether the subsidies granted in Germany are enough and reach the right persons. Up to date, after eight months of being active, no analysis about the new measures is known.

The intermediaries were divided when being asked about Collective Actions. On the other hand, the majority opted for meetings among intermediary colleagues to use synergies. It could be thought of bringing the interest groups together in a series of fora so that the intermediaries' synergies could meet representatives of consumers and foster business and growth of renewable heating.

As the internet is the main tool for information, it should be tried to use it in a way so that consumers and intermediaries benefit more of it.

### 1.9.3.2 Fields of interest and general perception of consumer mindset

The 17 interviewed intermediaries could indicate whether they operate in the fields of (a) solar energy, (b) ambient heat/heat pumps (e.g. geothermal energy), (c) fire wood/wood pellets/wood chips, (d) district heating/local biomass heating grids, (e) something else, or (g) to be also active in the field of heating with fuel oil, natural gas, coal, electricity only. Two of them indicated only one activity, and one interviewee was active in two fields, solar energy and fire wood/wood pellets/wood chips One intermediary was a general provider and provides all renewable sources and also fossil ones. Eight of the interviewed intermediaries offer services for the combination of solar energy, ambient heat/heat pumps, fire wood/wood pellets/wood chips and district heating/local biomass heating grids. The rest offers services in different combinations (see Figure 44).

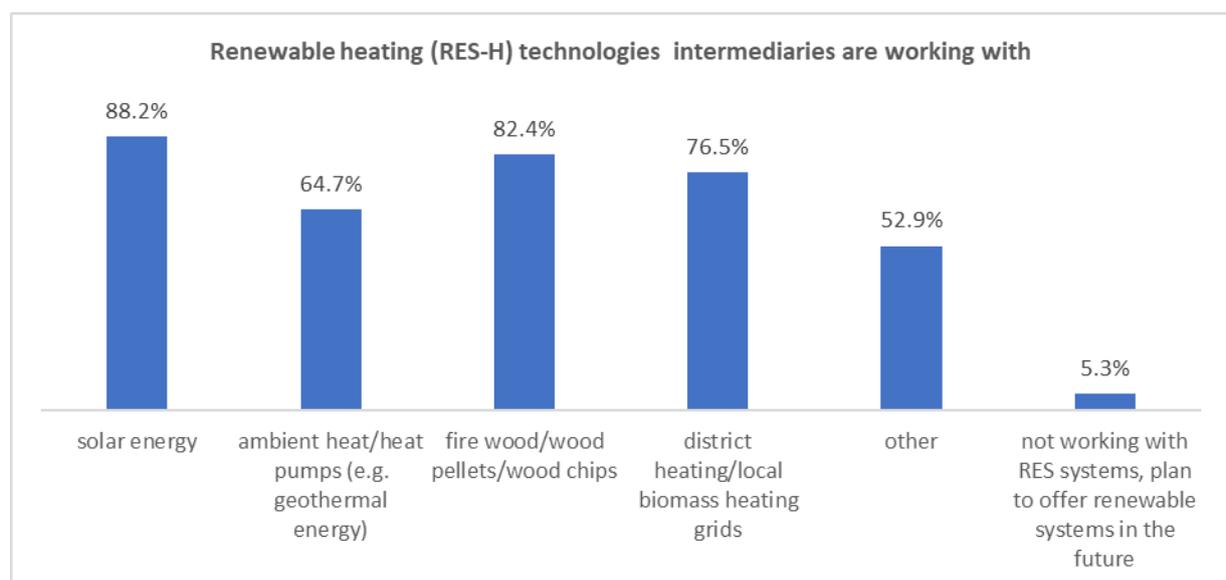
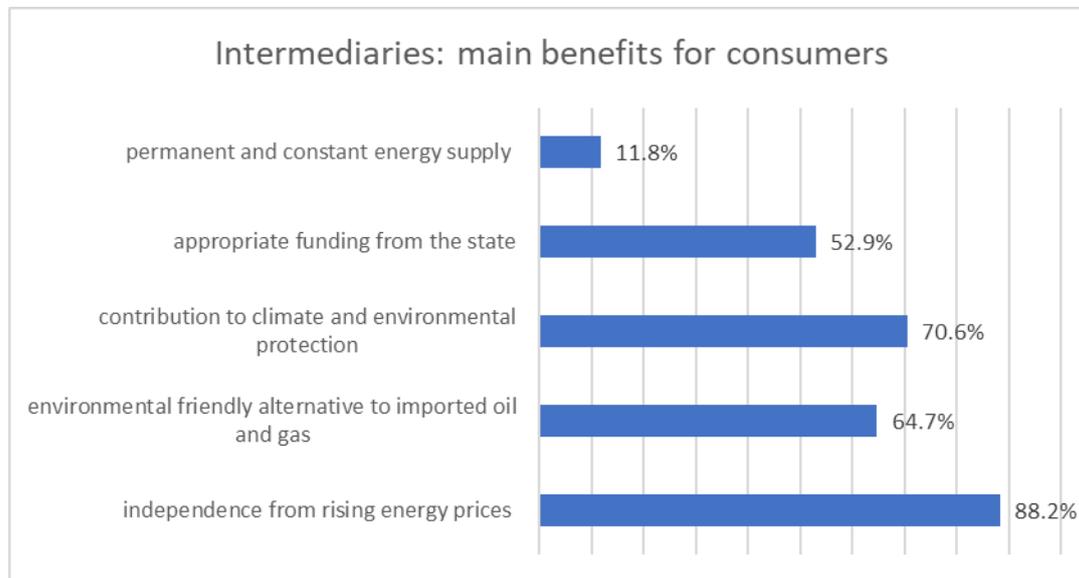


Figure 47: RES-H technologies interviewed intermediaries are working with (possibility to choose multiple answers)

Being asked about the **main benefits** for consumers, most of the intermediaries stated that these are the independence from rising energy prices (15 of 17), an environmental friendly alternative to imported oil and gas (11 of 17), and making a contribution to climate and environmental protection (12 of 17). The benefit of receiving an appropriate funding from the state was seen important for 9 of the intermediaries. Only two stated that a permanent and constant energy supply was a main benefit for the consumers. Figure 45 gives an overview about the multiple choices.



**Figure 48: Main benefits for consumers when installing a RES system, according to installers (possibility to choose multiple answers)**

It is thus a mix between a need to behave oneself in an environmental-friendly way while at the same time benefitting financially from lower energy prices in combination with funding from the state.

According to almost all of the intermediaries, in many cases a replacement of the old boiler by a RES system is not carried out because it is regarded as too expensive by the owners, and there is no necessary budget for it (15 of 17). An important role plays also the age of the heating system owners that (14 of 17), and if the heating systems runs without complication, then the owners neither think of a change (11 of 17). Technical issues or a general skepticism towards renewable heating systems play only a minor role (3 of 17 each).

Main reasons for being unsatisfied with the heating systems are a stated high energy consumption (11 of 17), a bad environmental footprint (9 of 17) and technical failures (8 of 17). The financial aspects, high fuel prizes and repair costs were mentioned by less than half of the intermediaries (6 of 17). The bad emission values or space occupation of the heating system plays only a minor role (3 of 17). Noise was never reported as problem of the current heating system.

Not all intermediaries, 13 of the 17, revealed how many consumers they perceive to change their heating system soon (within 1 year from now) and by which new fuel or heating system. The numbers of clients who are willing to change the system soon range between 20 to 50 %, in absolute numbers 5 to 130 clients. Of those intermediaries who also perceived the new system (12 of the 17 interviewees), the half said that in the region it would be a gas condensing boiler, and half of these boilers in connection with a renewable source (solar thermal). Almost the same number was given for pellet heating systems (five of 12), followed by heat pumps (three of 12) and one system to be fueled in the future by wood chips. Only once mentioned, however providing heat for most of the people mentioned was a district heating system to which 80 clients will be connected

### 1.9.3.3 Business, experiences, market and training

Being asked what gives more benefit for them, traditional fossil fuel heating systems or RES-H systems, the intermediaries were rather reluctant to answer. Eleven of 17 preferred not to reveal their thoughts on this issue. Of the six remaining intermediaries, only one said that the installation of a renewable system would be less beneficial for him, the rest benefits more when installing a renewable system, however it was mentioned that some experience with the new systems is needed to benefit financially.

Almost half of the intermediaries (seven of 16 answers) experienced neither negative nor positive aspects for consumer when they switched to a RES-H. In five cases, the predominant portion are positive aspects for consumers, showing open-mindedness and providing a good feeling if everything functions. In one statement, the unforeseeable final costs for district heating were seen as negative. Solar thermal systems that did not bring a reduction for the main system were reported once. A concerning aspect was stated also once, namely that, despite a changing climate, the (fossil) energy prizes are too low so that the payback period is too long for the consumers.

Once consumers contact the intermediaries, it does not mean that a discussed renewable system will be bought finally. Nine intermediaries revealed the reasons which were the main barrier. In seven cases, simply the high costs of the renewable heating systems hindered a realisation. More detailed, in one case high costs in combination with the long payback time, in another case high costs and the system finally did not fit to the building, and in one case the additional measures that had to be taken to realize the installation were the final barriers. Only once was reported as main barrier the fact of having too few skilled personnel to install a RES-H.

While answering overwhelming (16 of 17) that German framework conditions foster the installation of renewable heating systems, the intermediaries state to have enough support in 11 of 17 cases, and the remaining six answers only partly feel enough support from national level. At Federal State level (13 answers from 17), only two intermediaries felt enough support and eight did that partly. Three of the intermediaries negated enough support. On community level (13 answers from 17), the political support was felt even less, with eight times a partly felt support and five times denying to have enough of it.

The combination of services lead by the public administration and including issues as visits to the home to advice, is realistically not feasible in the region Oberland, as it would be seen as unfair competition. It was thus decided not to ask the intermediaries about such offer.

Collective actions seem a social fair measure at first sight. Despite that, eight of the interviewed intermediaries negated an interest to participate in such actions. Seven of the intermediaries fully supported collective actions, and two supported the idea in a qualified sense. In one of these limited supports answers, the benefit for the intermediary needed to be clear, and in the other one, the conditions for such collective action need to be well regulated. Figure 46 shows the considerable part of intermediaries who has no interest to participate in collective actions, which is unfavourable for this concept in the region Oberland. Approaching the intermediaries to convince them of the concept should be tried.

Intermediaries: perception of collective actions

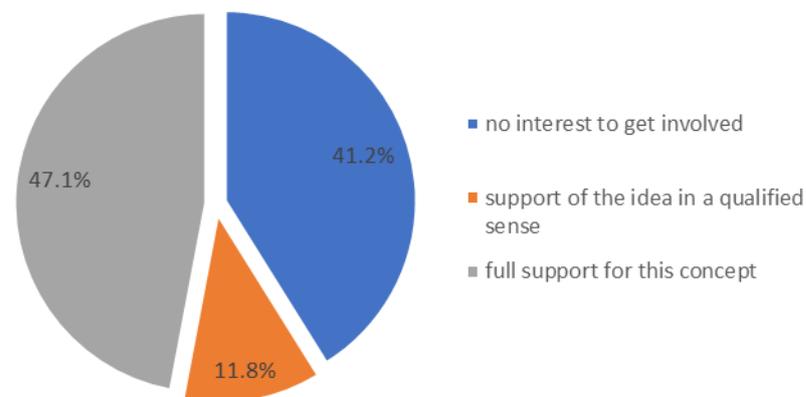


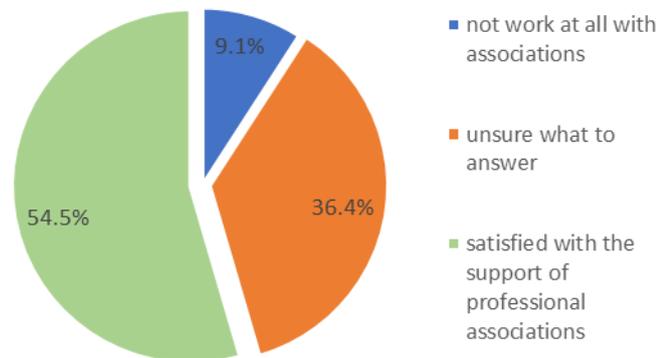
Figure 49: Intermediaries' perception of collective actions

Helping each other to use synergies between energy advisers and installers generally seems to be a good idea. Only one of the intermediaries interviewed considered this as problematic, when being asked for. Fourteen (of 17) intermediaries stated that helping each other is a good idea, suggesting to hold commonly talks or to support each other in the fields that are not covered by themselves. Twice, it was stated that helping each other could also mean performing good work, i.e. a correct heating load calculation, executing hydraulic balancing or just a serious planning.

When being asked where they liked to increase their knowledge, four intermediaries did not see any field, and two were generally open to increase their knowledge. The remaining eleven intermediaries, except two of them, had all different fields in which they would like to further develop. Namely, in rental systems, photovoltaics, deep geothermics, system hydraulics, subsidies, cost comparing, heating and cooling, hybrid systems, and fuel cell technology. One intermediary was interested in renewable energies in general, heating networks, CHP and heat pumps, and another one in district heating, contracting and tenant models. The different fields that are not covered by the single intermediaries show, that working together could increase the portfolios and such wise use existing synergies.

Only eleven intermediaries answered whether the professional associations are supporting the RES systems enough. Of these, one did not work at all with the associations, and four were unsure what to answer. The rest (six) was satisfied with the support of professional associations (see Figure 47), hauling out once GIH, the German association of independent energy consultants.

**Intermediaries: Support the professional associations the RES systems enough?**



**Figure 50: Opinions of intermediaries on whether professional associations support the RES systems enough**

The interviewed intermediaries inform themselves above all in the internet (eleven of 16 answers) about RES heating and cooling systems. Of course, they also use other sources for informing, namely specialised companies or manufacturers (four of 16), trade fairs (three times stated), training courses and associations (twice mentioned), and (each one time) colleagues, public fora and consumer advice centres.

## 1.9.4 Mindsets and interests of large investors and project promoters

### 1.9.4.1 Overview

The interviewed investors and project promoters (following referred to only as investors) covered all sources of renewable heating in Germany, but deep geothermic. They perceived that satisfying the sustainable attitude is the main benefit for consumers and have identified financial aspects as main barrier against investing in renewable heating. The presently rather low energy prices for energy were thus consistently identified as main motivation to continue using the fossil fuelled heating system. In contrast, investors see the financing of renewable heating systems in Germany as feasible, if all available subsidies are used.

Scepticism about renewable heating systems is widely spread among consumers, however, users of renewable systems seem to be mostly happy after having changed their heating system. This fact should be used by the investors to convince more consumers about their sustainable solutions. House visits might be a useful instrument to address this issue.

It is remarkable, that in Germany investors feel less political support, the smaller the political unit gets.

New concepts like Demand Respond and Collective Actions are not familiar to all of the investors or it is unclear how to realize them best. To address both issues, more cooperation between the investors (possibly in form of a public forum, to be used for knowledge exchange and for consumers' information) could be a way to strengthen the position and have a more powerful voice towards deciders in the political units.

### 1.9.4.2 Fields of interest and general perception of consumer mindset

Eight investors and project promoters that operate in the region were interviewed. Three of them were active in one single field of activities, two in district heating / local biomass heating grids, and one in the field of fire wood / wood pellets / wood chips.

The other combinations were, solar energy & ambient heat / heat pumps (1), solar energy & ambient heat / heat pumps & a further field (1), fire wood / wood pellets / wood chips & district heating (1), solar energy & fire wood / wood pellets / wood chips & district heating (1). One investor operates in four different fields, solar energy & ambient heat & fire wood / wood pellets / wood chips & district heating. Figure 48 gives an overview about the multiple answers given.

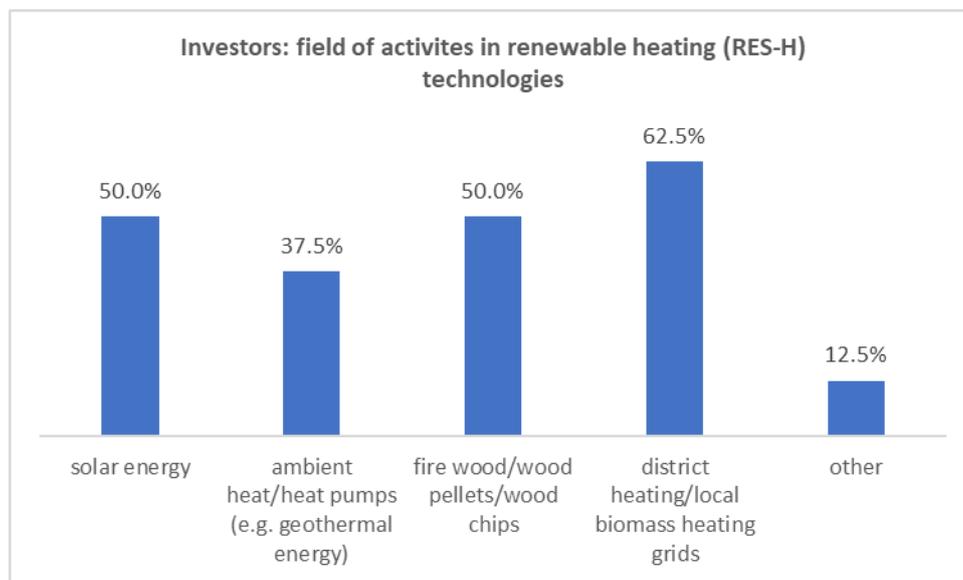
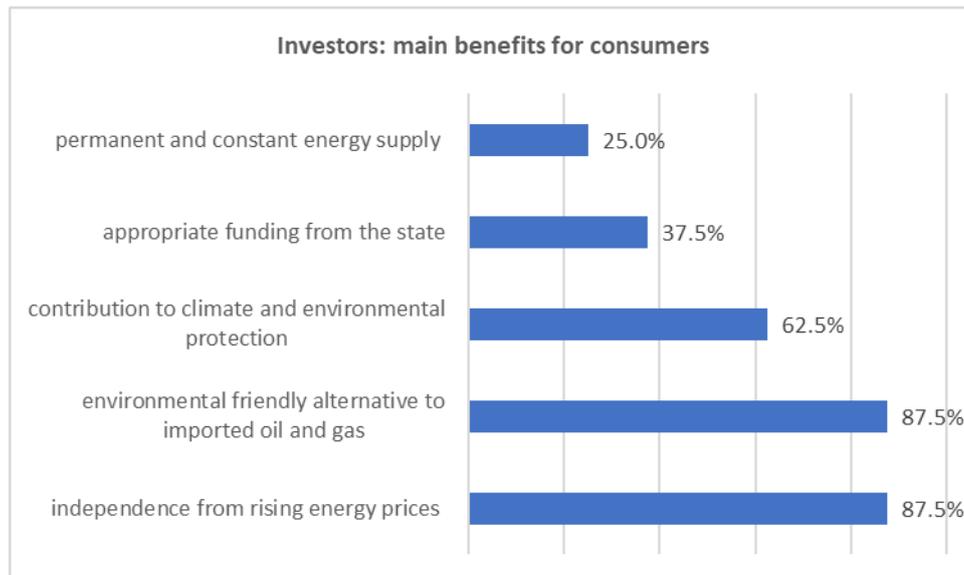


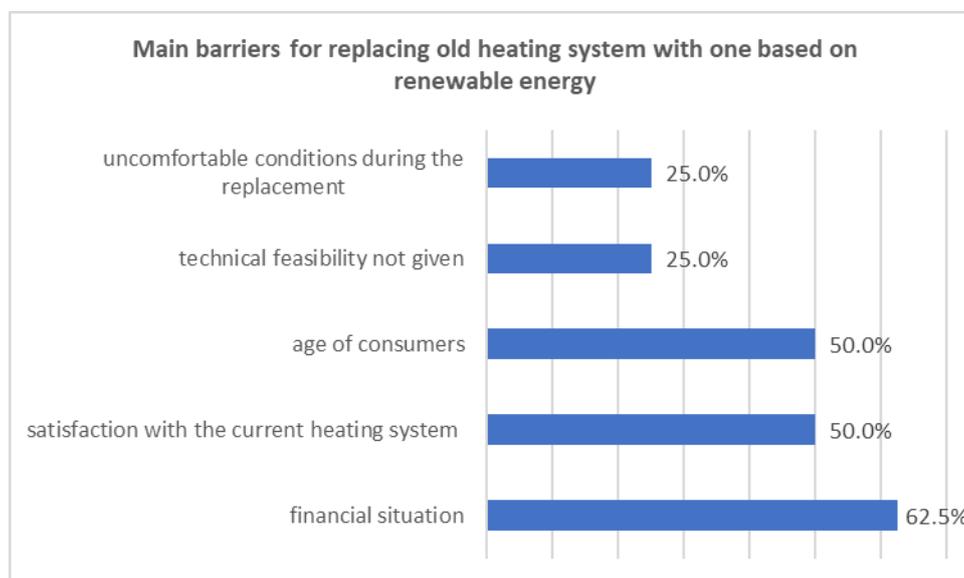
Figure 51: RES technologies interviewed investors are active in (possibility to choose multiple answers)

Figure 49 shows, that investors and project promoters see for consumers as main benefits the independence from rising energy prices and to have an environmentally friendly alternative to imported oil and gas (seven of eight). Five of them also saw the contribution to climate and environmental protection as benefit. The appropriate funding from the state was selected by three of the interviewees. A permanent and constant energy supply was only considered by two as main benefit.



**Figure 52: Main benefits for consumers when installing a RES system, according to investors (possibility to choose multiple answers)**

The main barrier for consumers is the financial situation, the needed budget for an investment is missing, say five of the investors. Half of the interviewees mean that being satisfied with the current heating system and frankly, the age of the consumers are real barriers for a replacement. Technical feasibility and uncomfortable conditions during the replacement were mentioned twice (see Figure 50).



**Figure 53: Main barriers for replacing old heating system with one based on renewable energy, according to investors**

The interviewed investors mostly perceived, that consumers are not satisfied with their heating system because of negative impact on climate and environment (seven of eight). Half of them said that bad emissions are the reason for consumers' dissatisfaction. Three times each were mentioned a too high energy consumption, the repair costs, and technical failures of the heating systems. High fuel prices were mentioned twice, and the need for too much space of the system was identified once.

Five of the investors did reveal which percentage of consumers will change soon (within one year from now) their heating system and by which. The range of customers that have actual plans for changes

was between 10 and 60 %. Of the four answers to which will be the new heating system, it was responded that in three cases it was a connection to a local heating net and once to a district heating net.

### **1.9.4.3 Business, experiences, market and training**

According to half the interviewed investors (four of eight), the end users' motivation to continue using fossil fuels instead of renewable ones is mainly because of the actual low costs. Twice mentioned was the already known system and the convenience of the end users as reasons for retaining fossil fuel users. Once mentioned was the influence of installers, who in some cases seem to be not supportive for renewable heating systems when being asked for advice.

The main motivation for renewable systems were climate protection and sustainability, said half of the interviewees. The political circumstances and funding options, and the low fuel costs when choosing a renewable system were mentioned once each.

It is obvious, that under the current prize conditions, the choice for a renewable system depends a lot on the firm conviction of the end users to contribute to a more sustainable future.

Five of the eight interviewed investors answered concretely about the size of their investments. These range between 50,000 to 4,000,000 €, which means that single end users are not the target groups for the investments of the interviewees. The lower end typically covers apartment buildings and hotels, a mid-sized wood chips heating system for 120,000 € is an example therefore. Typical examples for the upper end are large consumers, municipal real estate, residential and commercial buildings.

Generally, investors see the financing of renewable heating systems in Germany as feasible, if all available subsidies are used.

The six answers (two interviewees did not like to answer) about negative and positive aspects of providing consumers with RES heat instead of traditional fossil fuels revealed tow interesting facts. On the one hand (according to two answers), consumers are at first skeptical and doubt the reliability of only renewable heating systems. Of course, also the price of a renewable heating system is an issue of discussion.

However, if consumers have decided to change the heating system to a renewable fueled one, they become more and more satisfied, after being connected to a sustainable heating grid. Positive experiences with RES systems was reported, if consumers see low prices for electricity and heat and clean energy generation. Once reported was also the wish of the consumers for a low primary energy factor of the heating fuel.

Being asked, whether they liked to offer services for only RES heat, energy management or others, three of eight answered that they only liked to offer services for RES heat. Three more like to offer services for RES heat, in addition with services like energy management, maintenance, and advice on execution and complete packages (fuel supply/maintenance/billing). Once mentioned each as additional service each contracting and comprehensive advice.

Five investors revealed how they market their buildings that are fueled sustainably. Typically, the answers were almost completely individual, and are thus listed below as originally given:

- through targeted customer approach and detailed presentation of the concept.
- personal with customers
- using flyer, website, customer magazine, etc.
- internet, press, trade journals, lectures, mailboxes, information events
- about sustainability, the regional economic cycles and CO2 neutrality

The answers show, that a common marketing for consumers does not exist, and needs to be developed to the individual field of activity of the investors.

Not surprising, the **main barriers** that falters consumers to finally decide to change their heating system are of financial nature. Simply the costs (twice mentioned), costs and efforts, or doubts about the economy of the new system are typical reasons when consumers decide to do otherwise than originally planned. In the case of district heating, some consumers state that for them the heating costs are too high, negating the fact that for consumers in such case the life-cycle costs are lower as there is no need (for budget) for another boiler change in the future. In case the heating system is relatively new, then the price sensitivity is especially high.

In the region Oberland, there is also the challenge for investors, that regional established companies from the fossil sector offer dumping prices and make the business for renewable investors harder.

Unlike for the installers, in proportion, fewer investors in Germany feel that they have enough policy support on the national level (three of eight), and three of eight of the interviewees felt only partly enough support. One investor opted not to answer and another one stated clearly that the national support is not enough. At Federal State level (seven answers from eight), two investors felt to be enough supported and three had partly this feeling. Two investors negated enough federal support. On community level (seven answers from eight), none of the interviewed investors felt enough support and four stated to feel that partly. Three investors negated this completely.

Intermediaries and investors seem to have a similar low feeling of support from federal state and community level. It might be, that missing capacities of personnel in the authorities is the bottleneck to overcome this.

Being asked about their perception towards collective actions, from the seven answers that could be used, only one was indecisive. The majority (six from eight) of the investors is positive towards collective actions. One investor stated that collective actions should be supported by the state or by federal authorities. Once mentioned was also the possibility of crowdfunding. The investor who mentioned this possibility added however that for him, crowdfunding is assessed as being complicated (see Figure 51).

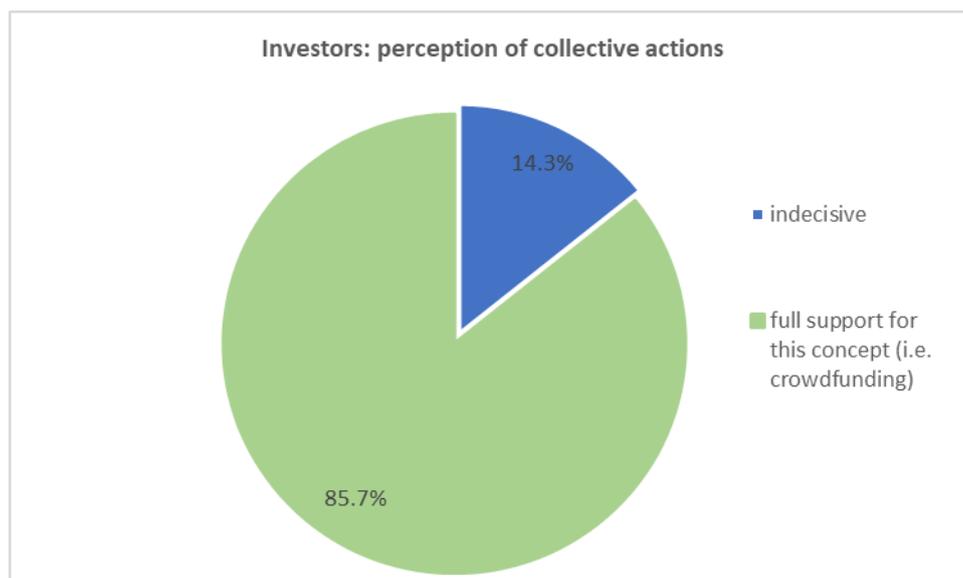


Figure 54: Investors' perception of collective actions

The general interest towards Collective Actions of the investors shows, that the groups of consumers and investors should be enabled to exchange in a direct way.

Demand Response programs were known to three of the interviewed investors (seven answers counted). Three of the interviewees were not familiar with the term and one was indecisive about it. Of the investors who use demand response (DR) programs, DR was considered of being very important to adapt the generation of heat to the demand in the buildings. The tenant electricity projects of the investor are thus all equipped with intelligent control systems. Clocked heating networks were also mentioned. In this case, the networks have to be well designed and, above all, regulated. Figure 52 shows that the concept of demand response needs to be disseminated more among investors.

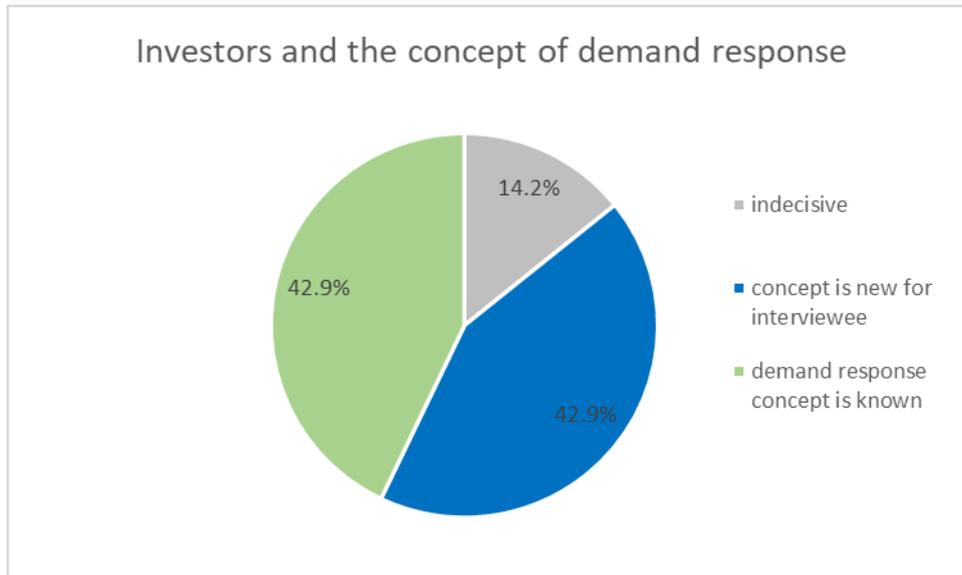


Figure 55: Investors knowledge about demand response

When investors need to look for more information about RES heating and cooling systems, the internet is the source they all use. In addition, associations are contacted and actual studies are used to inform. Investors of course also contact the manufacturers or producers directly (see Figure 53).

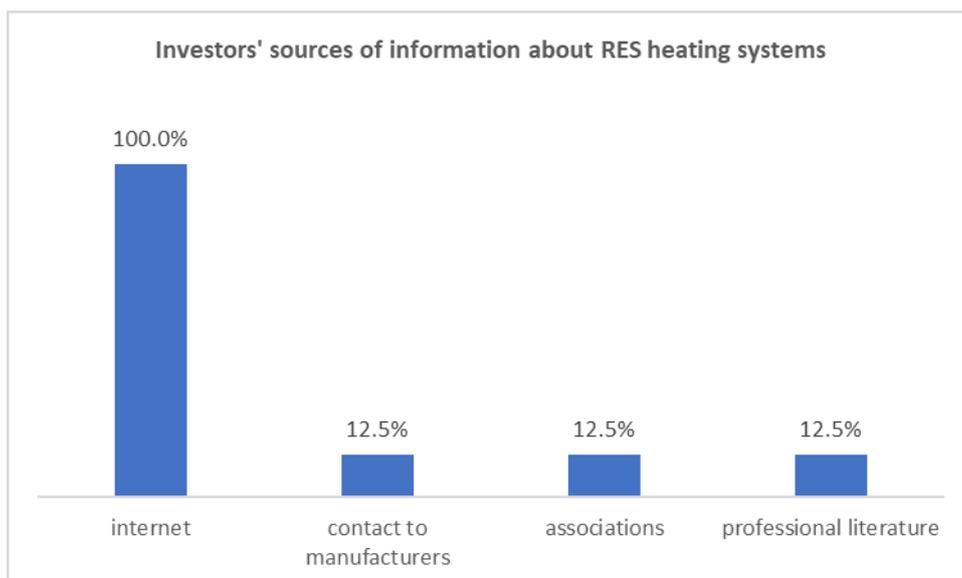


Figure 56: Investors' sources of information about RES heating systems (possibility to choose multiple answers)

## 1.10 North Macedonia – KAGoP region

### 1.10.1 Main conclusions

The activities planned to realize the inventories on the perceptions, attitudes and interests in KAGoP region are focused on obtaining accurate knowledge of the mind-sets and needs of all relevant stakeholders in the target region. Mind-sets and needs analyses for three different target groups were developed and conducted. The surveys for the end users, intermediaries and investors were adapted to local conditions in coordination with the local working group (LWG) in KAGoP region. Also, the LWG members contributed to realization of this task by providing potential contacts from each of the target groups that are competent to fill the survey. The preparatory work was completed in May, 2020. The next month questionnaires were distributed to the relevant stakeholders. With the COVID-19 restrictions the survey was performed online via email and Google forms. In the meantime, SDEWES-Skopje team was in constant communication with the interviewees for any assistance and clarification. The process of collecting the surveys and Consent forms was slightly longer than with physical activities and required more intensive SDEWES-Skopje efforts than originally planned. However, given the current situation these activities were successfully compiled.

The survey for the consumers was sent to 24 interviewees, out of whom sixteen interviewees completed the survey and the consent form. Our intention was to get balanced group of consumers in terms of their gender, age, housing type, income and current heating system. The second survey for the intermediaries was distributed to 22 and completed (the questionnaire and consent form) by twelve interviewees. A variety of energy advisors, installers, representatives of RHC equipment were taken into consideration. The survey for the third target group, the investors, was sent to 17 interviewees who have years of experience in the field, out of whom seven interviewees completed the questionnaire and the consent form.

Some of the main points of the surveys are presented in the following figures.

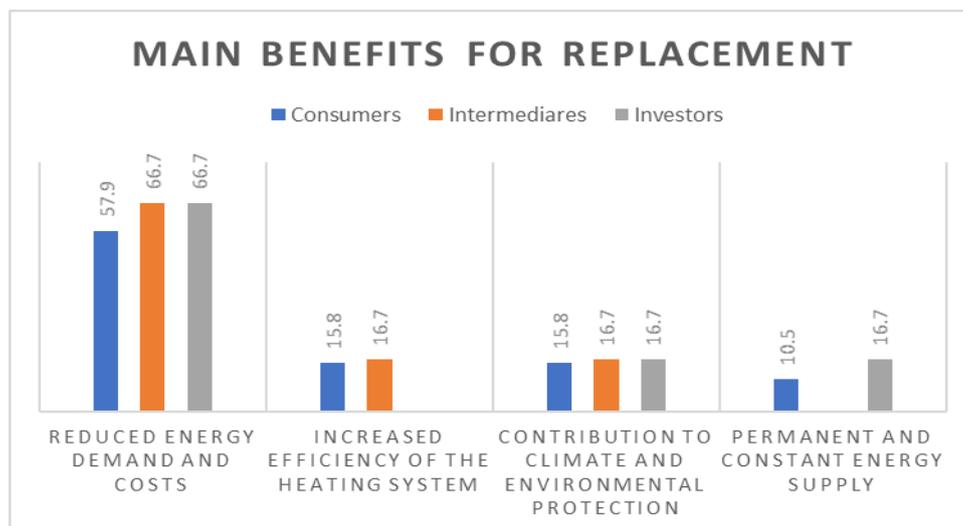


Figure 57. Overview of main benefits for replacement as noted by different target groups

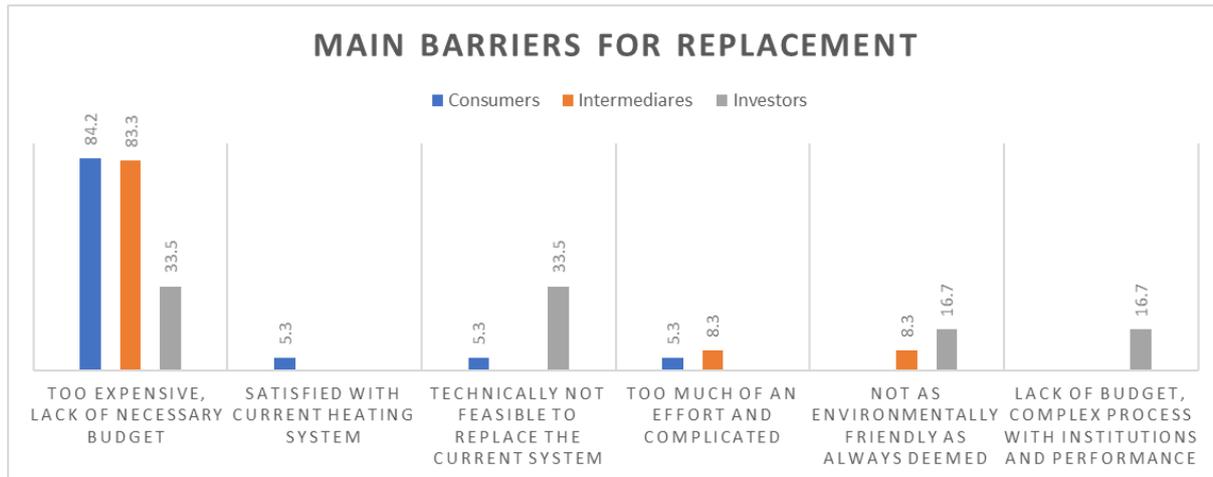


Figure 58. Overview of main barriers for replacement as noted by different target groups

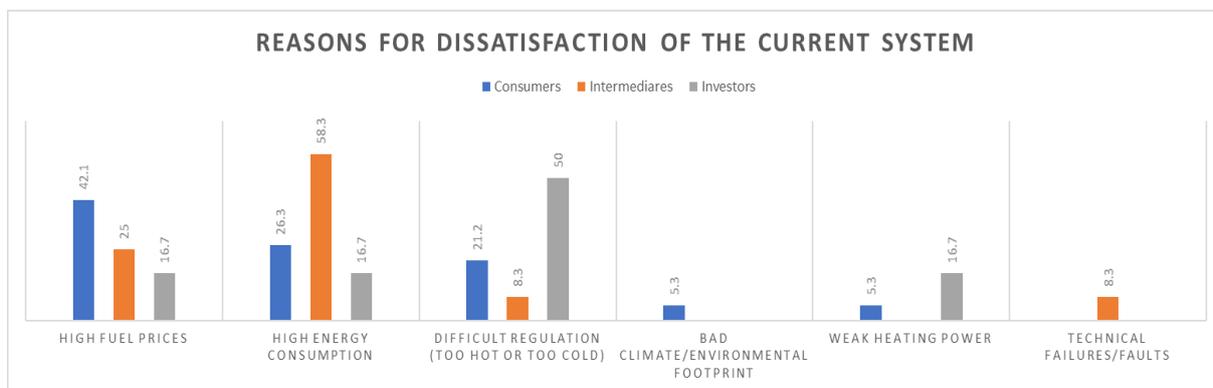


Figure 59. Overview of reasons for dissatisfaction of current heating system as noted by different target groups

A comparison (in %) between the three target groups is shown on several topics that are common for the consumers, intermediaries and the investors.

The general conclusion from the surveys about the main benefits from replacing the old heating system with one based on renewable energy is the reduction of the consumption of the end users and energy expenses. The major concern for the replacement is the lack of finance regarding the high costs for the new heating systems. In terms of which form of renewable energy is preferred by the interviewees for heating purposes, the heat pumps were at the highest priority. One of the key reasons for replacement of the heating systems is the rationale behind the dissatisfaction with the current system and the majority are not entirely content with the existing system because of the high fuel price and high energy consumption. In regards to the consideration of the end users to replace their heating system, the feedback was satisfactory as they are planning to switch from the inefficient heating system to RES based systems. The most common information source and channel that consumers use is Internet, as general assessable tool for any kind of data. Also, there is balance between positive and negative experience with installers, maintainers, etc. The most relevant to the consumers criteria to select a certain technology are the finances, i.e. the investment cost and savings. Concerning the type of information that the interviewees would like to have regarding the renovation of their heating system by a more climate friendly one is the economic aspect as mutual conclusion. A recommendation for energy efficiency (EE) measures will make boiler replacement more interesting and closer to the all target groups. Many of the interviewees feel that there is a room for improvement in the field of policy

support at national and regional level. Concerning the idea of collective actions and taking part in their promotion, interviewees expressed their positive attitude. All of the interviewees fully agree that the ESCO business model is suitable for future finance and installation of EE systems.

## 1.10.2 Mindsets and interests of consumers

### 1.10.2.1 Overview

Making inventories about the mindsets and interests of consumers could be time-consuming and challenging in different manners. Despite the COVID-19 situation and in time when physical contacts with interviewees is not an option, alternative measures need to be undertaken. A set of questions regarding the RES heating sector and new technologies were given to a specific target group, end users. This target group might be the most complex of the three target groups, due to the variety of people involved. Therefore, it was crucial to make several questions more personal in order to get familiar with the type of people answering the surveys. What is really important to mention is that this set of questions was voluntarily, so the consumers could choose whether they would answer or not. Our intention was to get as many details for the end consumers as possible and to be aware of their gender, age, housing type, income and current heating system. Another important question that we address the consumers was if their heating system was changed in the last five years. Location wise and in terms of the housing type, 52.6% of the interviewees are living in an individual house and 47.4% are living in a building. Regarding the gender aspect, 68.4% of the interviewees were male and 31.6% were female. The age balance between the consumers was taken into consideration, 57.9% of the interviewees are between 35-55 years, 36.8% in the age between 20 and 35 years and the rest were interviewees older than 55 years. The income issues might be one of the crucial things when a replacement of heating system is needed. The structure of the interviewees is as follows: 73.7% of the consumers have medium income, 15.8% are with low income and 10.5% have high income. As expected, more than half (63.2%) of the end users have traditional heating systems, but the percentage of consumers using renewables (36.8%) is rising and is much better than in the past years. Regarding the heating system replacement in the last five years 57.9% had negative answer, and 42.1% informed about their system switch and this percentage could be promising for the future and support more replacement campaigns of alternative technologies.

The main benefit from replacing the old heating system with one based on renewable energy for end consumers is to reduce the self-consumption and energy expenses. The major concern for the replacement is the lack of finance regarding the high costs for the new heating systems. In terms of which form of renewable energy could the end users imagine for their heating purposes, the heat pumps were at the highest priority. One of the key reasons for replacement of the heating systems is the rationale behind the dissatisfaction with the current system. The majority of the end users are not entirely content with the existing system because of the high fuel price. In regards to the consideration of the end users to replace their heating system, the feedback was satisfactory as they are planning to switch from the inefficient heating system to RES based system.

The most common information source and channel that consumers use is Internet, as general assessable tool for any kind of data. Also, there is balance between positive and negative experience with installers, maintainers, etc., from the end user's perspective. In particular, our interest was to get an overview about a situation when the consumers are thinking about boiler replacement who they consult with, as the majority of them will contact professionals from the RES H-C sector. Regarding the consumers perception on whether climate friendly systems will increase their home value, 80% believe that statement is accurate if they replace their old inefficient systems. The most relevant to the

consumers criteria to select a certain technology are the finances, i.e. the investment cost and savings. Concerning the type of information that end users would like to have regarding the renovation of their heating system by a more climate friendly one is the economic aspect as mutual conclusion. In addition, the level of awareness of the end users for different heating systems and new developments was assessed. Mostly addressed this issue positively, as they are familiar with the modern systems. In the end a recommendation for EE measures will make boiler replacement more interesting and closer to the end consumers.

### **1.10.2.2 General benefits, barriers, concerns and expectations**

The main benefit from replacing the old heating system with one based on renewable energy for end consumers is to reduce the self-consumption and energy expenses. Almost 60% from the interviewees agreed that this would be the crucial asset for transition to an efficient, environment friendly heating system and for replacement of the existing heating system. The increased efficiency of the heating system and the willingness to make a contribution to climate and environmental protection are secondary option to the interviewees, both quantified with almost 16% each. Permanent and constant energy supply was also seen as one the most relevant advantages in case of replacement of the heating system, with 10.5% of the survey.

Despite the strengths, there are several barriers for the consumers to overcome and align with modern technologies. The major concern for the replacement is the lack of finance. 84.2% of the interviewees express their opinion regarding the high costs for the new heating systems, as they might not be able to buy, install and maintain the whole system. Other difficulties that end users are facing are the lack of technical feasibility to replace their current system and the required effort which will complicated and disrupts their lives. These options have share of 10.6% from the total overview on this point. Other 5.3% are satisfied with their current heating system, as they might have changed the system with a renewable alternative or have strong belief in the more traditional systems.

In terms of which form of renewable energy could the end users imagine for their heating purposes, the heat pumps were at the highest priority. 58% of the interviewees are leaning towards the usage of the geothermal energy and ambient heat. 21% would rather use district heating or join the local biomass heating grid, if possible, in the future. However, the solar energy was considered as a huge potential as 15.8% are interested in installing solar collectors or PV systems and additional 5.3% could use the solar energy in combination with gas.

One the key reasons for replacement of the heating systems is the rationale behind the dissatisfaction with the current system. The majority, 42.1% are not entirely satisfied with the existing system because of the (1) high fuel price or (2) the high energy consumption (about 26.3%). The regulations of the system, i.e. the effort to regulate the systems right in order to adjust the right temperature (hot or cold) is within the top 3 reasons with 21.2%. However, the mindset of the end users is changing towards the environment protection, which means that 5.3% of the interviewees are not satisfied with their current system because of the bad climate and environmental footprint. The same percent of the consumers (5.3%) are concerned about the heating power of the system being weak.

In regards to the consideration of the end users to replace their heating system, the feedback was satisfactory with 58% of the interviewees are planning to switch the heating with renewable energy. As a country which is not in the top of the most developed countries, this is really important issue to stress and to evaluate the realistic situation in order to accomplish and align with the goals of the REPLACE project as well. Even with this mapping of mindset and understating of end consumers attitude and behaviours, it is the first step towards green changes and prioritizing the essential needs in this sector. Nonetheless there is some percentage of consumers that are not planning to replace

with new energy source. Additional 15.8% are considering a replacement of the heating system, but with the current fuel - central heating, natural gas and electricity (5.3% each).

### **1.10.2.3 Attitudes, channels and preferences**

The information sources and channels the consumers use is the Internet, as general assessable tool for any kind of information. Understandably, 84.2% of the end users are taking the advantages of the Internet, plus 5.3% are completing their knowledge with other media. The same percentage use books in order to get detailed data for the technologies and systems, apart from the Internet. The rest of the interviewees point that the conferences on that matter are useful source to boost their knowledge and enlarge the sights about the latest heating technologies and alternative fuels.

There is balance between the positive and negative experience answers with installers, maintainers, etc. However, a great part of the interviewees did not have any experience with installers, mostly due to their central heating system. Few interviewees brought out their positive feedback for example heating the whole apartment and constantly maintaining the same temperature. Another positive example was with the installation of boilers. Some of the end users mentioned the usual experience with no substantial concerns, or that they are rather indifferent whether their experience was positive or negative. Nevertheless, there were a couple of negative examples with inexperienced staff for installation of RES systems. Consumers are seeing this situation as a negative promotion for RES and people in general might give up or not even start with the replacement, although in first place they were determined to do so. This could reflect with mistrust to the other installers and companies that offer such services. Another setback was identified in a situation when problem occurred with switching the heat pump from heating to cooling. The installers were under skilled to determine the electricity consumption for the heat pump, as well. Moreover, the lack of professional staff and maintenance of the pump, made this distressing experience for the end user.

Lately the consumers are taking brave steps and dealing with challenges in order to replace the old boilers, thus they are using the subsidies from the municipalities or at national level, which increased the level of replaced systems. In particular, our interest was to get an overview about a situation when the consumers are thinking about boiler replacement who they consult with. The majority of the consumers are playing safe and will contact engineers, professionals in that specific area or with involved parties from the RES H-C sector. Most of the end users confirmed that the companies specializing in heating/cooling with many years of experience are right choice to undertake in order to replace their heating system. Others would rather contact manufacturers and distributors of the specific equipment. The fact that several of the interviewees would research on their own at first was positively surprising. They would as well contact other users (more than one) with similar technical solutions to share their experience and make a market research. After consulting similar practices, some will additionally check for opportunities and offers online or check with the sales team from a professional company. Many of the consumers will read materials and consult with the available literature and representatives of the companies that offer the services and technical solutions. Contractors, installers, energy advisors are one of the first choices that consumers will reach out in case of boiler replacement. However, some of them would also consult with the academia sector for more detailed information and advises.

Regarding the consumer perception on whether climate friendly systems will increase their home value 80% believe that their value will be increased if they replace their old inefficient systems. Very few of the interviewees are thinking that this change will probably, but not significantly increase their home value. The rest are doubting that this measure will make any difference in the home price.

The most relevant to the consumers criteria to select a certain technology are the finances, i.e. the investment. The technology costs and the savings are highly significant to the interviewees in terms of

installation of new systems or replacement for better option. The interviewees prefer to have comparison with the current heating system to make sure if the replacement pays off. They would like to be aware of the technology efficiency, the environment benefits of the RES systems and the possibility of independent system management. Few of the interviewees had very concrete criteria such as price of the entire system, system sustainability and durability, cost of maintenance after installation and refund time. The environmental footprint of the change should also be considered. Furthermore, the reduced consumption, secured long-term solution and higher quality in the heating were relevant for others. Couple of the consumers yet do not have defined criteria for selection of a particular technology.

Concerning the type of information that end users would like to have regarding the renovation of their heating system by a more climate friendly one, the economic aspect was mutual response. More specific, some of them are interested in costs and savings, as well as environmental impact. Other would prefer to be informed about the efficiency and comparison between the heating systems. They emphasized the need of diverse information on the new innovative and highly efficient systems. The installation time and budget, the maintenance costs, heating power and quality were important for another group of consumers. Consumers prefer to be shown real examples in terms of technical capabilities, offers, analysis and comparison for advantages and disadvantages, so they would be able to make the right decision. Couple of the interviewees were precise about what information they would like to have such as the amount of electricity produced (kWh), method of system connection, investment costs, savings calculation in relation to the investment, replacement procedure if case. There were examples where consumers are already familiar with particular technology and most likely they will replace their heating system, but they lack specific information on the manner of implementing heat pumps on already built residential buildings, as well heat pump efficiency and effectiveness. To generalize this topic, end users would like to receive information about the efficiency of the system, the economic viability, the reliability of the system, the possible costs of maintaining the system and other information regarding the technical specification.

Our intention was to assess the level of awareness of the end users for different heating systems and new developments. Mostly (70%) addressed this issue positively, as they are familiar with the up to date systems. 10% of the interviewees have superficial knowledge, without profound details and information in certain technologies, for example heat pumps. The rest are partially or insufficient aware of the possibilities and better alternatives for heating.

In regards on how to make boiler replacement more interesting and closer to the end consumers, four aspects were chosen as they would be of help in the selection of more climate friendly system. Firstly, was the need of recommendation for EE measures with 31.6%. High percentage of the interviewees believe that the technical recommendation for choice of systems would be helpful in their decision. 26.3% point out that collaboration with banks for financial help is on the top of their list. Moreover, 15.8% vote that the list of installers offers would make their chose less complicated and would ease the process of installation or replacement to more climate friendly system.

## **1.10.3 Mindsets and interests of intermediaries**

### **1.10.3.1 Overview**

The intermediaries are focused in several RES-H fields and are working with more than one technology or energy source. Half of the interviewees are specialized for heat pump and the others prefer the combination of solar, geothermal energy and biomass as well. From intermediaries' point of view the main benefits for consumers when installing a RES system of highest preference is to reduce self-consumption and energy expenses. With regards to the most common barriers to consumers replacing

their old boiler with an alternative system, the majority 83.3% believe that the process is too expensive and that they don't have the necessary budget for it. Another important issue that was tackled during the surveys from the intermediaries' side were the reasons why consumers are not satisfied with their current heating system and the main reason was the high energy consumption. According to the intermediaries, the number of clients ready to replace their old heating system is still modest. However there have been some improvements, as 60% of the customers decide on replacement.

In general, the intermediaries agreed that the RES-H systems could add more benefit than the traditional fossil-fuelled heating systems, indeed 90% of them believe that the renewables are the future in the heating sector. With regards to negative and positive aspects with consumers, positive experiences dominate in general with emphasis on several positive practices with installation of heat pumps. Concerning the type of services that the intermediaries would offer to a RES-H system user, 66.7% could provide a whole service package including the installation, the maintenance and the energy management of the system. The main barrier for the consumers to finally install a new heating or cooling system is the cost of the technology, as 58.3% of the intermediaries assume. Many of the interviewees feel that there is a room for improvement in the field of policy support at national and regional level. They admit that there is some, but not enough support from the respective institutions. Concerning the idea of collective actions and taking part in their promotion, 90 % of intermediaries expressed their positive attitude. In terms of what aspects would be of help to choose a more climate friendly system, 58.3% of the interviewees believe that better collaboration with banks for financial assistance would ease the system replacement. Another aspect of highest importance to assess in our region is the readiness of the companies and intermediaries to accept the ESCO model of financing such projects. All of the interviewees fully agree that this is the future in financing and installing EE systems. The interviewees are willing to contribute for better understanding between the installers and the energy advisors and help each other by sharing experiences and information.

Concerning the preferred content and format of targeted information, our survey tackled various aspects. At first, they would like to improve their knowledge in the latest development in the EE and RES systems. According to the intermediaries, a greater involvement of the subsidies is needed for increased application of RES technologies, as 58.3% of the interviewees found it this as a main reason for lack of efficient and renewable systems. Regarding the outcome about where the intermediaries are looking for information about RES heating and cooling systems the Internet was the first choice.

To sum up a great part of the intermediaries think that all above stated reasons could have a role in the improvement of the RES systems replacement and combining all that could be win-win for RES to penetrate on the market in full capacity.

### **1.10.3.2 Fields of interest and general perception of consumer mindset**

The intermediaries are focused in several fields of RES-H and they are dealing with more than one technology or energy source. However, 45.4% of the interviewees are specialized for ambient heat and heat pumps. 18.2% of the intermediaries are working with solar energy. Many of them are interested in coupling RES technologies and have combined technologies in their scope of work, for instance 18.2% are dealing with solar energy, heat pumps, fire wood/wood pellets/wood chips. Furthermore 9.1% of the interviewees explained that their work is based on consulting for RES technologies. The rest of the intermediaries would like to expand their services to other RES-H technologies, as this industry and sector is fast changing and their aim is to be in line with the latest trends and developments.

From intermediaries' point of view the main benefits of highest preference for consumers when installing a RES system is to reduce their energy demand and energy expenses, which is the same as from the end users survey. Almost 67% of this target group assume that reason as crucial when comes

to replacement of RES systems. The increase of heating system efficiency and the contribution to climate and environmental protection comes on second place as main benefit for installing RES system. They share the same percentage accounted for 16.7%, each.

Regarding the most common barriers to consumers replacing their old boiler with an alternative system, the majority 83.3% believe that the process is too expensive and that they don't have the budget for it. Additional 8.3% of the interviewees suggest that consumer might have the traditional state of mind, and consider RES systems not as environmentally friendly as always deemed. The same percentage of the intermediaries assume the replacement of the heating system could require too much of an effort, thus it complicates and disrupts their lives.

Another important issue that was tackled during the surveys from the intermediaries' side were the reasons why consumers are not satisfied with their current heating system. The main cause is the high energy consumption, more specific 58.3% of the interviewees. At second place with 25%, fuel prices which are still very high, are considered as reasons why end users hesitate to make changes. 8.3% of the intermediaries find that the heating system might be difficult to be regulated by consumers. The same percentage presume that the technical failures or faults of the system are the reason for lesser satisfaction with their current heating system.

According to the intermediaries, the number of clients ready to replace their old heating system is still modest. However, there are some improvements. Overall, the intermediaries are convinced that the future of intensive development and installation of RES system is near. For some of the interviewees the number of clients determined to replace their system is poor. Others made some assumptions of 5-30 % of their consumers. A great part of the interviewees expresses their positive feedback, as more than 50-60 % of their clients intend to make a change in their technologies. They emphasize the interest in heat pumps. Moreover, some of them were very concise and provide us percentage per technology such 65% individual RES heating system, 5% central heating and 30 % are not planning any investment in the field of EE systems. Another example was in regards to the willingness to transit from woodstoves to inverters or heat pumps, but the existing technical situation would not allow such intervention. Nevertheless, great example was given about the high interest in companies as well, beside the individual housing properties. However, it all come to the bottom line of financing opportunities, possibility to raise the educational and relevant information level.

### **1.10.3.3 Business, experiences, market and training**

In general, the intermediaries agreed that the RES-H systems could add more benefit than the traditional fossil-fuelled heating systems, indeed 90% of them believe that the renewables are the future in the heating sector. They also have very positive experience with heat pumps, as they could increase the financial benefit of the consumers. Very few of the interviewees expressed opposite opinion and claimed that traditional system will bring greater benefits. On one hand a right conclusion was given within the intermediaries' example as they propose that in case of properly dimensioned system according to the client's demand, the resource will depend on the location and the need. On the other hand, the situation in our country seemed to be quite different. If only a matter of price per kWh for individual buildings was involved, wood heating is unfortunately still the cheapest compared to other available energy sources (pellets, oil, electricity), but renewable systems offer comfort and regulation, which can sometimes lead to greater financial gains. However, the natural gas is the most suitable for heating industrial buildings, as the interviewees noted.

With regards to negative and positive aspects of heating for the consumer is in general positive experience. Especially they mentioned several positive practices with installation of heat pumps. The heat pumps with solar collector for preparation of sanitary hot water and adequate automatic energy management are great example for individual houses and collective buildings. On the contrary some

of the interviewees passed some less satisfactory experience for heat pumps, as the investment is too pricy. Hardly any of the intermediaries have negative examples, mostly due to tractional behaviour of the end users and the process of adapting to new technologies which are the right solution and there is an urgent need of them. Others have both, positive and negative experience on daily basis.

Regarding the type of services that the intermediaries would offer to a RES-H system user, 66.7% could provide a whole service package including the installation, the maintenance and the energy management of the system. 25% of the interviewees will be able to offer installation and maintenance and the rest (8.3%) could perform only the installation part of the entire process.

The main barrier that intermediaries see for the consumers to finally install a new heating or cooling system is the cost of the technology with 58.3%. The lack of subsidies on national and local level are stated as the second barrier with 25% in which interviewees think could increase the replacement percentage. Almost 17% of the interviewees believe that the barriers for the consumers could also be found in complicated financial offers and support from the banks in addition to the cost of the technologies.

Many of the interviewees feel that there is a room for improvement in the field of policy support at national and regional level. They admit that there is some, but not enough support from the respective institutions, the Government and the local self-government units. Certain support is given from the international institutions such GEF Program. Others were indifferent in regards of this topic or are not quite familiar with the support schemes. However, the intermediaries would like to have greater support and are looking forward to a better collaboration.

Concerning the idea of collective actions and taking part in their promotion, 90 % of intermediaries expressed their positive attitude. They would be more than content to promote and present the collective actions. The only negative answer is good sign for improvement of the mindset of the interviewees, as a chance to learn something new, meet different stakeholders and have benefit of mutual activities.

In terms of what aspects would be of help to choose a more climate friendly system, 58.3% of the interviewees believe that better collaboration with banks for financial assistance would ease the system replacement. Additional 25% of the intermediaries assume that the recommendation for EE measure could contribute to this aspect. Other 8.3% would rather accept the technical recommendation for system and technologies as right manner to address this issue. The same percentage of the intermediaries express their affection to the creation of the list of installers offers.

Another aspect of highest importance to asses in our region is the readiness of the companies and intermediaries to accept the ESCO model of financing such projects. All of the interviewees fully agree that this is the most suitable model for financing and installing EE systems in the future.

Collaboration within relevant stakeholders should receive greater attention as mutual communication is vital for improvement and sustainable developments. Almost all of our interviewees are willing to contribute for better understanding and help each other by sharing experiences and information. Others believe that a legal regulation would promote better cooperation between energy advisers and installers. The interviewees find that the energy controllers should get in touch with the households even before the installers and consult with the property owners about the system that they are planning to use and the EE class of the dwelling. Also, the energy controllers could contribute in the awareness and education raising and receive knowledge of the latest market system equipment, so they could share that to the installers as well. Some of the interviewees assume that joint performance of the intermediaries in front of potential investors with energy analysis of the facility and the experience and offer of energy efficiency systems might be well solution.

Concerning the preferred content and format of targeted information, our survey tackled various aspects as relevant in order to increase their knowledge. At first place they would like to improve their knowledge in the latest development in the EE and RES systems. Also, the ESCO model was one of the top choices as information that could be explored more thoroughly. The intermediaries are also interested in new approaches and experiences in the implementation of the EE concepts. Others have interest in learning more about the best practices in the construction of zero energy buildings.

According to the intermediaries, a greater involvement of the subsidies is needed for increased application of RES technologies, as 58.3% of the interviewees found it this as a main reason for lack of efficient and renewable systems. Moreover, 16.7% believed that reduced tax for RES equipment could improve the current situation. Nonetheless 8.3% of the intermediaries assume that campaigns and trainings will encourage greater application of RES in the region. However, a great part of the them think than all above stated reasons could play a part in the reduced RES systems and in the same time that their combination could be win-win for RES to penetrate on the market in full capacity.

Regarding the outcome about where the intermediaries are looking for information about RES heating and cooling systems the Internet was the first choice. Almost 17% of the interviewees are using the Internet in combination with books, conferences, flayers and brochures to improve their knowledge and get the latest information of different topic related to RES and EE in the heating systems.

## **1.10.4 Mindsets and interests of large investors and project promoters**

### **1.10.4.1 Overview**

Half of the interviewees are more focused in modernisation of existing heating fossil fuelled systems (fuel oil, natural gas, coal, electricity), most likely because of the current market needs. From investors' point of view, the main benefits for consumers when installing a RES system is to reduce the self-consumption and energy expenses. 66.7% of our interviewees believe that this is the most common reason for replacement of the old system. Beside the benefits of the installation or replacement of heating systems, it is really important to assess the primary barriers for the consumers. The first reason regarding the replacement of their old system by RES systems is the lack of sufficient budget. As 33.5% of the investors believe that these systems might be too expensive for the end users. Regarding the reasons why consumers are not satisfied with their current heating system, half of the interviewees assume it is the regulation of the system, which could be sometimes difficult to adjust to right temperature. Concerning the percentage of consumers, they perceive that will change soon their heating system, the answers we got were quite different. Some of the interviewees are optimistic and believe that 80% of their clients are looking for alternatives and are encouraged to make changes in the technology. On contrary, few of the interviewees assume that only 10-20% of the consumers are prepared to change the heating system.

The range size of investment of the investors is mostly on small-scale. Half of the interviewees are working with investments up to 300.000 EUR. In regards to the negative and positive aspects of providing consumers with RES heat instead of traditional fossil fuels, investors expressed balanced mixture of answers. The services that investors would like to offer customers are referring to RES heat and EE systems. They are keen to promote solar energy systems as the most available and adequate to install. Others would rather offer some multi-split systems and central heating as better alternative than old boilers. Some of the investors are motivated to work with the financing opportunities in the scope of RES field and to be supported from the respective funds. In terms of what services, the investors offer to the consumers, they could provide the full package of energy management. The

investors assume that the consumers are familiar with the advantages that comes with an apartment that use RES system. In that direction various positive campaigns investors undertake when offering apartments for sale in terms of energy class and RES application. The main barrier that investors see for the consumers to finally install a new heating or cooling system is the uncertainty in the period of exploitation, as for half of the interviewees believe that is the case. About the policy support at national and regional level, investors feel that there is some, but not enough support. The investors believe that the collective actions and the demand response programs are leading combination within the RES-H sector. They are encouraging the idea of collective actions and demand response programs in the region. In terms of where investors are looking for information about RES heating and cooling system, once again the Internet is the priority tool.

#### **1.10.4.2 Fields of interest and general perception of consumer mindset**

Half of the interviewees are more focused in modernisation of existing heating fossil fuelled systems (fuel oil, natural gas, coal, electricity), most likely because the current market needs. Although they would rather use RES-H, their work is a consequence of the overall present situation in the heating sector. However, improvements could be seen in the field of heat pumps and there is higher interest in their performance and availability to be integrated in the existing and new dwellings, as 33% of the interviewees are focused in that area of the alternative heating systems. Moreover, progress is made in the field of utilization of solar energy, for instance 16.7% of the investors are focused and interesting in solar technologies. In total, the mindsets and interests of the investors are changing in order to be in line with the latest legal regulations in the country for the EE and RES of the buildings.

From investors' point of view, the main benefits for consumers when installing a RES system is to reduce the self-consumption and energy expenses. 66.7% of our interviewees believe that this is the most common reason for replacement of the old system. The same answer was given by the other target groups, the end-users and the intermediaries, which proves that all target groups are on the same page about the main benefit in case of efficient heating system. Another gain for the consumers would be the contribution to climate and environmental protection, as the investors believe that nowadays this is also crucial for them. Some of the interviewees presume that the need of permanent and constant energy supply might be of great relevance to the consumers.

Beside the benefits of the installation or replacement of heating systems, it is really important to assess the primary barriers for the consumers. The first reason regarding the replacement of their old system by RES systems is the lack of sufficient budget. As 33.5% of the investors believe that these systems might be too expensive for the end users. Another issue is the technical feasibility. The same percentage of the investors assume that it is not possible for the consumers to replace their current system. Certain mistrust in the environmental impact is seen from the investors, for instance 16.7% believe that end users are more traditionally oriented and the systems are not as environmentally friendly as shown. The rest of the interviewees think that there is more than a single reason to complete the replacement. Indeed, the budget and the complex process with respective institutions and the heating system performance are making the replacement unattractive to the consumers.

Regarding the reasons why consumers are not satisfied with their current heating system, half of the interviewees assume it is the regulation of the system, which could be sometimes difficult to adjust to right temperature. Weak heating power, high fuel prices and high energy consumption share the same percentage from the investors' opinion. All three options with 16.7% each might be the reason why the consumers are less satisfied with the heating system and tend to replace it.

Concerning the percentage of consumers, they perceive that will change soon their heating system, the answers we got were quite different. Some of the interviewees are optimistic and believe that 80% of their clients are looking for alternatives and are encouraged to make changes in the technology. On

contrary, few of the interviewees assume that only 10-20% of the consumers are prepared to change the heating system. In addition, they will be even more willing to change to RES-H system if they could receive any financial assistance at national or local level or from the respective funds for increasing EE and RES in the households.

#### **1.10.4.3 Business, experiences, market and training**

The range size of investment of the investors is mostly on small-scale. Half of the interviewees are working with investments up to 300.000 EUR. 16.7% of the investors have medium size investments. Their range is between 300.000 – 1.000.000 EUR. The others from the interviewees don't find this applicable for their business.

In regards to the negative and positive aspects of providing consumers with RES heat instead of traditional fossil fuels, investors expressed balanced answers. Some of them have rather positive experience with customers, as their clients were satisfied with the final outcome. However, couple investors had negative experience in terms of lack of finance of the end users' side and low level of awareness and standards. Also, some of them haven't had any positive or negative experience with their clients.

The services that investors would like to offer to the customers are referring to RES heat and EE systems. They are keen to promote solar energy systems as the most available and adequate to install. Others would rather offer some multi-split systems and central heating as better alternative than old boilers. Some of the investors are motivated to work with the financing opportunities in the RES field and to be supported from the respective funds.

In terms of what services the investors offer to the consumers, they would offer the full package of energy management. This aspect is one of the few things that they are offering to market their services in order to increase the promotion of their business, with an emphasis of that being the right choice and beneficial for the end users. The focus of the promotion of their buildings is the central heating, as it is the most convenient solution for the clients, nowadays. Additionally, they have different loans that might attract the end users that cannot cover the whole price at once.

The investors assume that the consumers are familiar with the advantages that come with the apartments that use RES system. However, the financial aspect again is crucial for them to decide what choice they will make. Some of the interviewees also believe that there is a good percentage of people who don't have sufficient knowledge about the benefits of RES-H systems. Moreover, that gives more space to improve this aspect and to contribute in the awareness raising and promoting as many as possible advantages of the new technologies.

In that direction, investors undertake various positive campaigns when offering apartments for sale in terms of energy class and RES application. Generally speaking, they would like to promote the effectiveness of the RES usage as contribution to climate and environmental protection, but also as a smart investment for the future. Others like to promote the idea of the EE of the apartments and the great potential and effects that could be achieved.

The main barrier that investors see for the consumers to finally install a new heating or cooling system is the uncertainty in the period of exploitation, as for half of the interviewees believe that is the case. Another issue is the higher investment price, so 33.3% of the investors find that this could be one of the barriers. The reluctance of new technologies is a possible barrier for the end users to accept something that is different from the usual. 16.7% of the interviewees consider this as a problem that consumers should overcome to improve the overall residential heating sector.

About the policy support at national and regional level, investors feel that there is some, but that is not enough. Public subsidies are more than welcomed and should be intensified. Some of the interviewees are not familiar with this topic and would rather not speculate if the level of policy support is adequate. Others believe that there is a necessary amount of legal support for RES and EE systems.

The investors believe that the collective actions and the demand response programs are leading combination within the RES-H sector. They are encouraging the idea of increased need of the collective actions and demand response programs in the region, as the joint implementation will achieve the purpose more efficiently than the individual action. Joint action is of crucial importance to promote such actions and programs.

In terms of where investors are looking for information about RES heating and cooling system, again the Internet is the priority tool. However, they are consulting the global media and webinars to keep up with the latest information on that matter. Also, part of the interviewees would like to profound their knowledge by reviewing the literature and specialized companies in the RES field. Some of the interviewees are seeking for information by recommendation from other in order to find the particular details that they could use.

## **1.11 Serbia**

### **1.11.1 Main conclusions**

Since March 2020, a state of emergency were in force in Šabac twice time, caused by the COVID19 pandemic, which limited the number of people who could attend an event. According to the decision of the crisis headquarters of the city of Sabac, the maximum number of people allowed in one place (both open space and closed space) was five, while maintaining physical distance and using protective equipment.

Following the stated measures and restrictions, five meetings were held with citizens, owners of heating and cooling systems and devices, two meetings with intermediaries and one meeting with investors. All those present at the meetings filled in the survey form, taking into account the statement related to the confidentiality of data in accordance with the Law. The mediators submitted the completed questionnaires by e-mail, and in seven cases a telephone interview was conducted. Investors sent four completed questionnaires by e-mail and two telephone interviews were conducted.

The conclusion that can be reported is that all survey participants understand the need to increase the share of renewable energy for heating and cooling, understand that excessive use of fossil fuels causes climate change and are aware of the need to mitigate the negative effects of climate change and environmental needs. However, it was pointed out that the financial effects should be taken into account, including the fall in the price of fossil fuels, especially the reduction in the price of natural gas, which increases the competitiveness of this fuel and the fact that new and more efficient renewable energy technologies mean higher investments compared to traditional technologies that use fossil fuels.

It was pointed out that the lack of subsidies for the application of renewable energy is a serious problem that must be solved in communication with the local and state administration. An example is given of the Law on Efficient Use of Energy, which states that local governments can subsidize the use of renewable energy, but only if investors use energy for their own needs. Unfortunately, there is no example that this possibility has been applied anywhere in Serbia (including the city of Sabac), although the Law was adopted in 2013.

The trend of increased demand for the installation of wood pellet boilers in households in the event that household owners build new buildings or replace existing inefficient devices is positively assessed. The increase in the number of pellet boilers is a visible process, but unfortunately it is still very slow and is not systematically monitored and supported. The construction of small district heating networks in which wood-fired boilers were installed was positively assessed, as well as the replacement of coal and heating oil boilers in school buildings in suburban settlements. A good example is the project to improve the energy performance of existing multi-family buildings, which the city of Sabac has supported since 2010. This project was assessed as an example of good practice when it comes to collective actions.

Consumers are deterred by high investment costs in replacing inefficient heating and cooling devices that use renewable energy, although they generally support the transition to "green" energy. They are aware that increasing the share of renewable energy reduces environmental pollution, especially air pollution due to GHG emissions, but also dust and other pollutants emitted by fossil fuels. They are also aware of climate change and the effects that have become more pronounced in recent years and affect the local economy in suburban and rural parts of the city, because it should be noted that the city has 51 rural settlements where agriculture is the main activity. In addition, Sabac is the administrative center of the Macva region, where agriculture is the leading industry.

In rural areas, citizens are owners of biomass and there is interest in joining energy cooperatives and initiating collective actions aimed at collecting wood biomass or residues from agricultural production. Citizens point out that they expect help and support from both local and state administrations through subsidies or the application of other models such as guarantee funds and easier access to financial institutions precisely because investment costs are high and often an insurmountable barrier.

On the other hand, the biggest problem for installers is that there are no cooperation mechanisms, they do not have their own association and they do not have communication with the local administration. They also point out that without subsidies and other models of financial support, it will not be possible to achieve significant results in replacement activities, and the transition to green energy will be very slow.

The situation is similar with energy advisors. In general, experienced designers of heating and cooling systems deal with energy consulting, but they do not have their own associations and there is no communication with the local administration. The situation is somewhat better than with the installers because there is an engineering chamber organized at the regional and state level, so there are periodic trainings, exchange of experiences and presentation of new technologies through workshops and webinars. The opinion of energy advisors is identical regarding the need to establish a scheme of subsidizing and supporting renewable energy technologies. Both installers and energy advisors agree that the most attractive technologies for the territory of Šabac are the use of biomass, water-to-water heat pumps as well as solar energy.

The mediators include building managers, a representative of a consumer association as well as a representative of environmental NGOs and a representative of the BioSol project from the ongoing cross-border cooperation program between Serbia and Croatia, which promotes the use of wood chips and solar energy in small remote systems. heating. It is proposed that future activities focus on better cooperation with manufacturers of heating and cooling equipment, education through training and

through the activity "open door" which would improve communication with consumers, users of heating and cooling systems and devices. As an example of good practice, the BioSol project was pointed out within the framework of the establishment of the Academy for Energy Efficiency and Renewable Energy Sources.

Investors agree that incentive schemes are needed and that in the specific example of Sabac, they are motivated by cooperation with the energy company for district heating and to support projects to increase the share of renewable energy in district heating. Investors are directing their activities towards the urban part of the city and prefer to connect buildings to district heating and small district heating networks that use renewable energy. They are interested in heat pump technology since the quality of new buildings allows the use of low temperature heating systems but they emphasize the problem with infrastructure and space constraints, which is why district heating is the optimal choice.

The group of investors also includes a representative of the energy company for district heating in Šabac (PUC "Toplana-Šabac"), who mentioned the company's development plans. The company's intention is to include a heat pump plant in the district heating system in following years, which would use wastewater from the city system for the treatment of municipal wastewater, and a boiler plant with a wood-chip boiler. In that way, in the next five years, they would build plants that would deliver up to 70% of renewable energy in relation to the capacity of the district heating system.

This group includes the Business Association "Heating Plants of Serbia", which has a head office in Sabac. The Association of Energy Companies for District Heating of Serbia supports projects in Sabac that improve the energy performance of buildings owned by consumers and that are connected to the district heating network, and believes that these are examples of good practice. Experience in the implementation of these projects could be shared with other district heating energy companies in Serbia at regular or specially organized meetings and webinars. The business association "Toplane-Srbije" encourages manufacturers of district heating equipment to take part in these events and thus promote the use of renewable energy in large district heating systems. The significance of the support of the Business Association "Toplane-Srbije" is that the replacement activities will be more visible at the national level, in the media and among heating and cooling experts.

## **1.11.2 Mindsets and interests of consumers**

### **1.11.2.1 Overview**

The survey regarding the attitudes of citizens towards replacement activities was conducted in several city zones with citizens of different ages, social status and life habits. Most respondents were in the middle age group 46-65 years (44.12%) and 31-45 years (32.35%) compared to other groups up to 30 years (8.82%) and over 65 years (14.71%). The age structure of the respondents is shown in the diagram that follows:

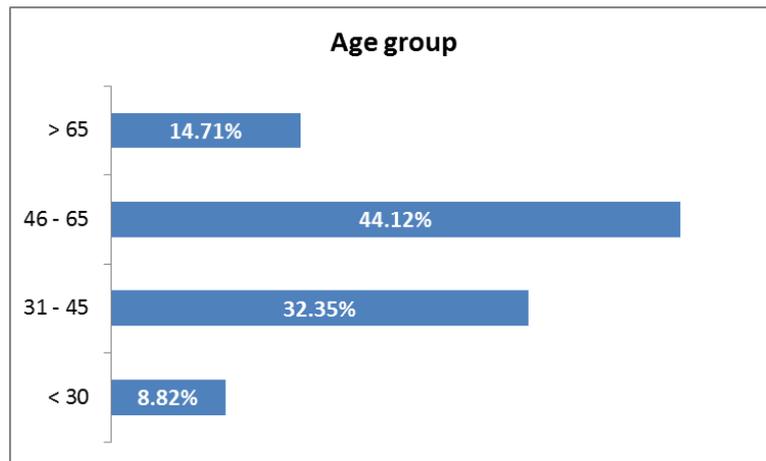


Figure 60 - Age group of interviewed consumers

The majority of consumers who participated in the survey are homeowners (82.35%), and the rest are apartment owners in multi-family buildings (17.65%). 11.76% live in buildings with more than 10 floors and 5.88% live in buildings with less than 10 floors.

Consumer apartments in multi-family buildings are connected to the district heating system and all single-family homeowners use their own small fireplaces. District heating uses natural gas as the only fuel, and projects are underway to build new heat sources that will use renewable energy. In single-family households, the most chopped wood is used, but also electricity, coal, natural gas and pellets. A significant number of households use natural gas because in the period from 2005 to 2010, a 200 km long gas distribution network was built, to which slightly less than 3,000 households were connected. The gas pipeline network was not built in suburban and rural settlements that belong to the territory of the city of Sabac.

The types of buildings owned by consumers who participated in the survey are shown in Figure 2 and the share of individual fuels and heating technologies is shown in Figure 3.

There is no district cooling network in Sabac and only a few office buildings have a centralized cooling system. In apartments and all other business premises, individual split cooling devices are used, which work as heat pumps in the reverse cycle.

The survey did not include any user of heat pump technology, although there is unofficial information that there are a small number of households that use water-to-water heat pumps, but only for heating. Unfortunately, there is no official data on that.

As can be seen from the diagram in Figure 3, there is no data on the use of thermal solar systems or for heating sanitary water or as support for heating systems.

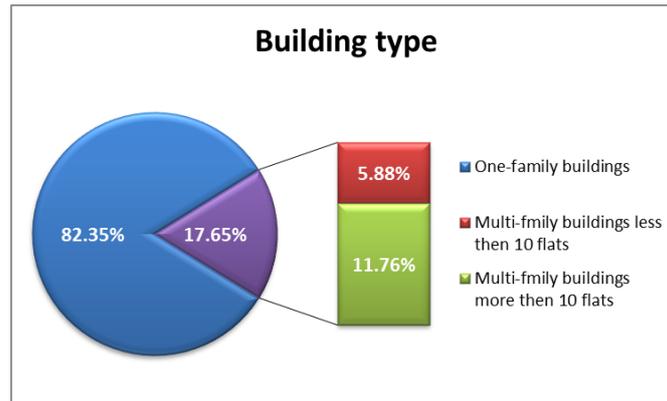


Figure 61 - Building type

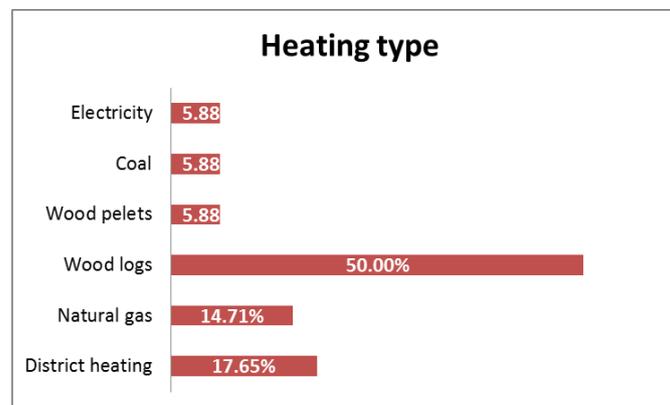


Figure 62 - Heating type

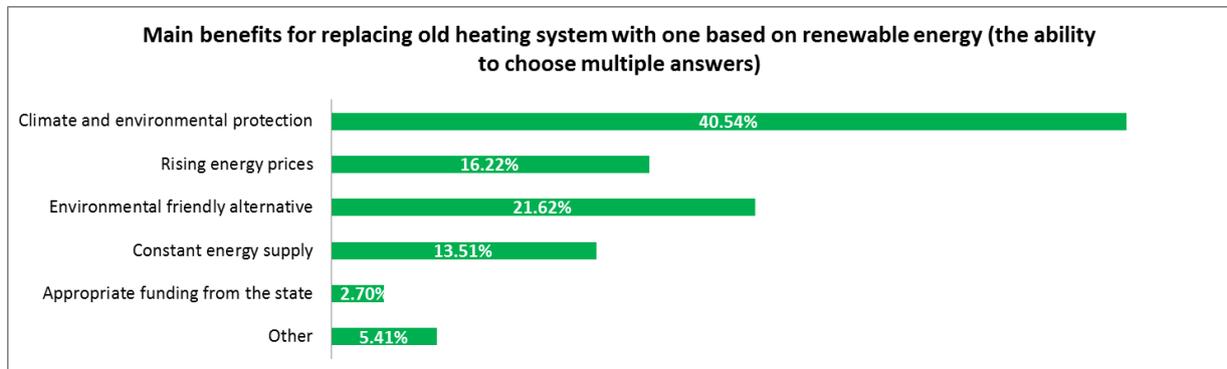
Replacement activities in multi-family buildings also rely on the project to improve the energy performance of existing buildings. Most buildings in Sabac were built in the period before 2000. Technical standards at the time of construction were not sufficiently focused on the thermal properties of the building and the consequence is high energy consumption and financially unsustainable space heating. Since 2010, through collective actions, energy efficiency measures have been applied, which included thermal insulation of the building envelope and in some cases the installation of thermostatic valves and cost allocators. The barrier that makes it difficult to implement projects in multi-family housing is the way of decision-making. It is necessary for more than two thirds of the owners of special parts of the building (apartments, business premises, garages) to declare their support for the project in order for the activities to start. The Law on Housing and Building Maintenance, which defines this issue, has been in force since 2016, but there are still not enough experiences and examples of good practice.

### 1.11.2.2 General benefits, barriers, concerns and expectations

#### The main benefits for replacing your old heating system with one based on renewable energy

The largest number of respondents believe that climate and environmental protection (40.54%) as well as environmentally friendly alternatives (21.62%) benefit from the replacement of inefficient and obsolete devices used in households for space heating. A smaller number of consumers associate the replacement with a reduction in heating costs (16.22%) and a secure energy supply (13.51%). If we carefully follow the trends in the fossil fuel market, especially the price of natural gas, the consumer's attitude is quite logical because with falling fossil fuel prices and lower investment in traditional

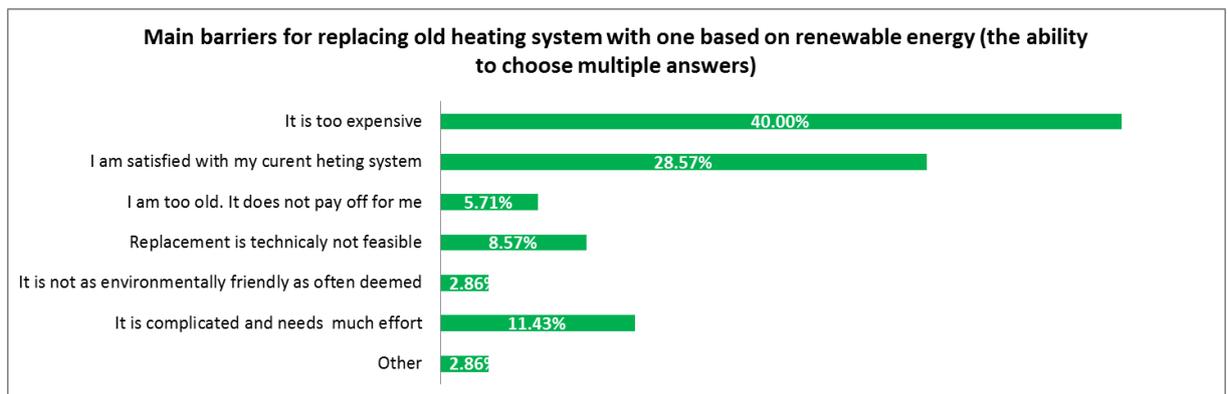
technologies (gas boilers) consumers are not sufficiently motivated to replace or purchase new modern devices and technologies that use renewable energy.



**Figure 63 - Main benefits for replacing old heating system with one based on renewable energy**

Considering that so far there have been no incentives to replace old and inefficient devices, a very small number of respondents (2.70%) voted for this option.

### Main barriers for replacing old heating system with one based on renewable energy



**Figure 64 - Main barriers for replacing old heating system with one based on renewable energy**

Consumers believe that the amount of investment is the biggest obstacle to the replacement of old and inefficient heating systems (40.00%). Citizens who use natural gas boilers as well as tenants in buildings connected to district heating have a positive opinion about their existing heating systems (28.57%). However, the response of consumers living in multi-family buildings connected to district heating should be taken with a caution, because in this case the replacement is difficult to implement due to problems with space for independent heating (biomass or heat pump), problems with infrastructure (for heating pumps, it is necessary to provide connection to the public electricity network, which can often be an insurmountable problem) as well as due to the manner of decision-making (consent of the qualified majority of apartment owners is required).

Replacing old and inefficient heating systems can be technically unsustainable (8.57%) or too complicated and requires too much effort (11.43%) so consumers find it difficult to decide on this step. It should be added that for the elderly it is difficult to imagine an explanation of the payback period of the investment (5.71%), especially if they live alone in households (the consent of a qualified majority of apartment owners is required).

A very small number of people who participated in the survey believe that the use of renewable energy is not important as it is often thought (2.86%) or has some other reason (2.86%) why they think that the replacement is unsustainable.

### Form of renewable energy that consumers can imagine choosing for heating purposes

The owners of single-family buildings show the most interest in wood pellet boilers and heat pumps (water-water type). In multi-family residential buildings, the greatest interest is for heat pumps (air-to-air type) for small split devices that are used for heating individual rooms as well as for cooling during the summer period. Interestingly, only a small number of consumers recognize the concept of a thermally insulated building and the use of thermostatic valves (including the use of cost allocators on radiators) in heating installations connected to district heating and energy consumption optimization using a heat pump (in this case split devices). This fact leads to the conclusion that attention should be focused on education and information of consumers and installers to promote this way of using heating installations in cases when it is not possible to completely replace old and inefficient heating systems in multifamily buildings with renewable energy technologie.

The importance of thermal solar systems for domestic hot water heating and use as a support to the heating system is completely marginalized, although there is a significant potential for the use of solar energy.

### Reasons for dissatisfaction with current heating system

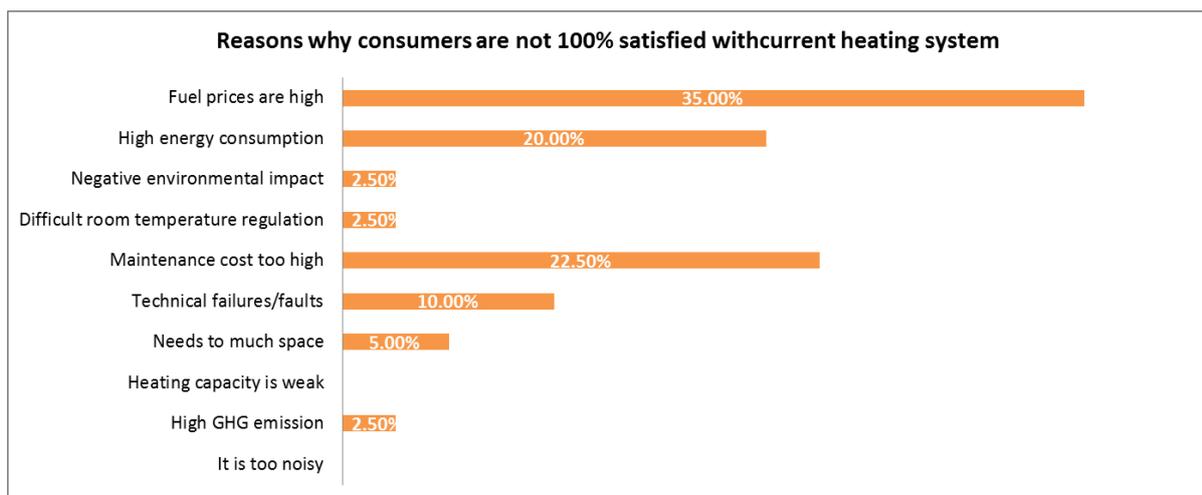


Figure 65 - Reasons why consumers are not 100% satisfied with current heating system (the ability to choose multiple answers)

Analyzing the consumer responses, the conclusion is that the reasons for dissatisfaction are of a financial nature.

Most respondents stated that the price of fuel (energy) is too high (35.00%), then that maintenance costs are high (22.50%) and that energy consumption is too high (20.00%) which can be associated with the use of inefficient devices and poor energy properties of buildings. Dissatisfaction with the security of energy supply due to failures of the heating system (10.00%) as well as due to insufficient capacity of the heating system (0.00%) was not highlighted as a significant motivating factor for replacement.

Based on consumer responses, it can be concluded that they recognize the environmental problem of using fossil fuels and the need to preserve the environment, but that it is not highly positioned on the scale of impacts that generate dissatisfaction, negative impact on the environment (2.50%) and high

greenhouse gas emissions (2.50%). Consumers who use coal-fired boilers point out that they are dissatisfied with the emission of soot and dust during the heating season.

The required space for storage of heating equipment or space for fuel storage is the cause of dissatisfaction of consumers who use individual fireboxes with boilers on split wood or coal (5.00%).

### Consideration of heating system replacement; changing to a new energy source/fuel

Regardless of the facts in favor of replacing old and inefficient devices, the decision is still based on financial effects. According to the answers given in the survey, the same number of consumers intends to replace the existing heating system (50.00%) as the number of consumers who do not plan to do so.

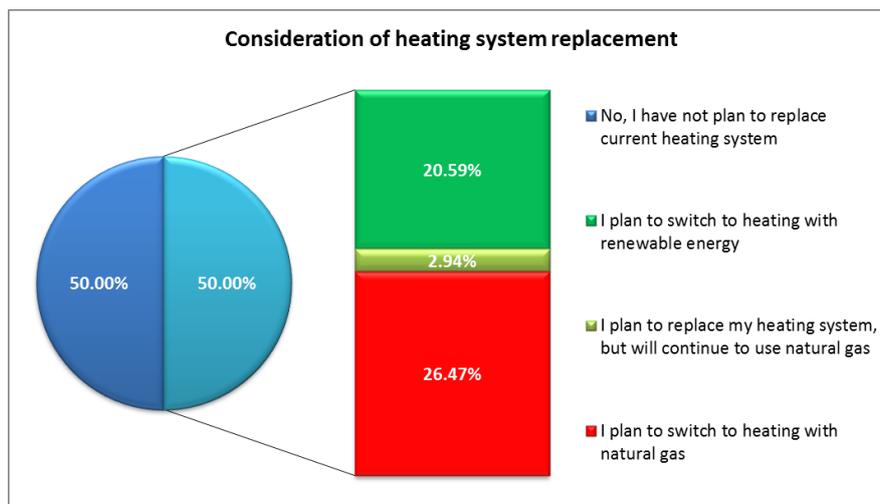


Figure 66 - Consideration of heating system replacement

Apartment owners in multi-family buildings do not plan to replace it because it is technically very difficult to do, and if this issue is to be raised as a collective action, the consent of a qualified majority is required.

Owners of single-family homes are more motivated to replace old and inefficient appliances with natural gas boilers (26.47%) due to favorable conditions, such as lower investment costs compared to renewable energy technologies and lower price of natural gas compared to pellets. Heat pumps are not always an acceptable solution due to inadequate thermal insulation of buildings. In that case, it is necessary to report the thermal insulation of the building before installing the heat pump, which increases the investment costs and consumers are often not able to finance it at the same time.

Inadequate thermal insulation of buildings is the reason why none of the consumers stated that they want to invest in solar systems in support of existing heating systems. On the other hand, the low price of electricity does not contribute to the motivation of consumers to use solar energy to heat domestic hot water.

### 1.11.2.3 Attitudes, channels and preferences

#### Negative and positive aspects of heating for the consumers

Consumers who participated in the survey emphasized that they expect low heating costs (50.00%), low energy consumption (16.67%), better comfort (13.89%), safe and continuous energy supply (11.11%) as well as easy handling of the heating installation (5.56 %). Surprisingly few responses were:

low emissions of greenhouse gases, dust and soot (2.78%), despite the fact that environmental discussions were mentioned as one of the priorities in discussions with consumers.

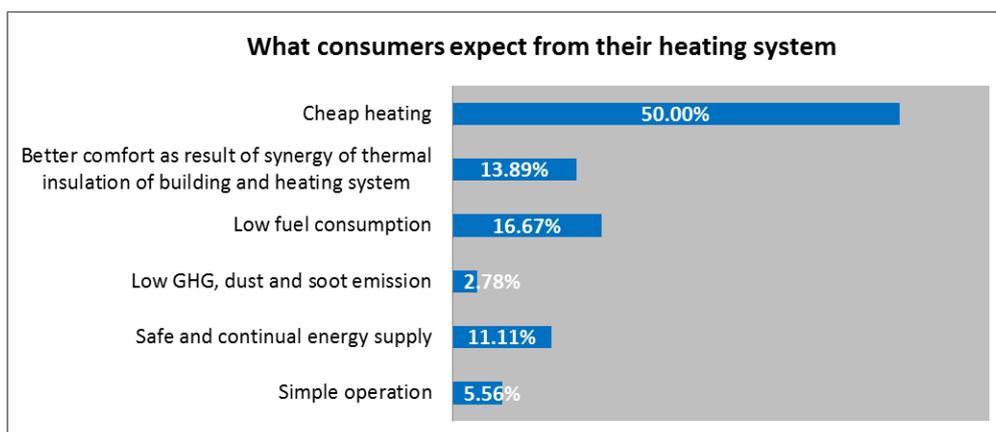


Figure 67 - Consumers expectation from their heating system

The explanation can be found in the fact that heating costs represent a very high item in the costs of housing and maintenance of buildings. When asked about the share of heating costs in relation to the total overhead costs of housing, consumers commented as shown in Figure 9.

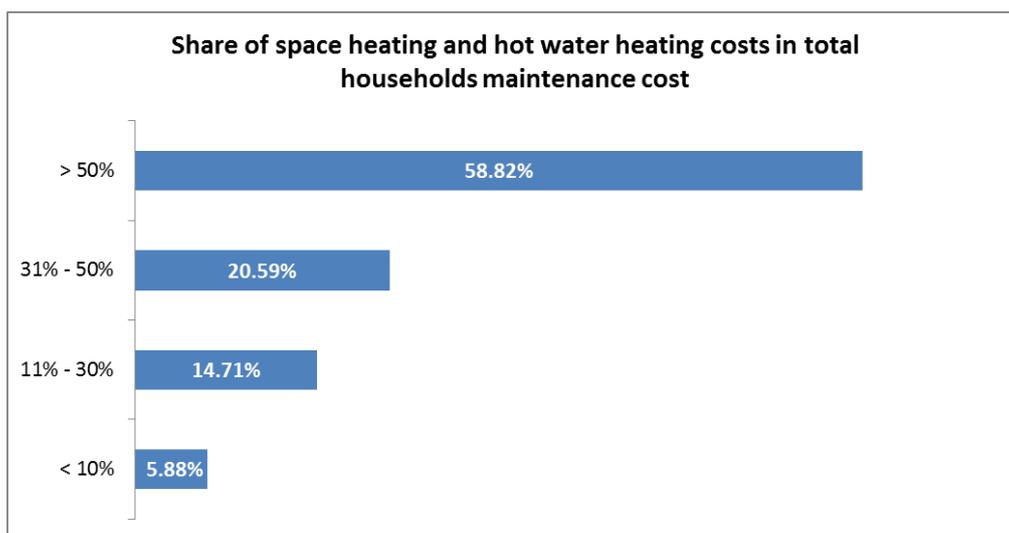
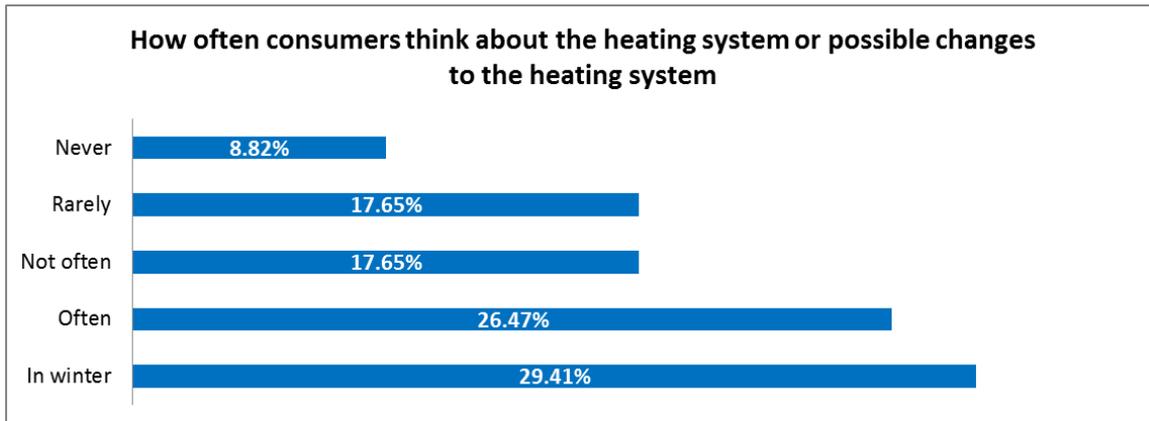


Figure 68 - Share of heat cost in total households maintenance cost

In order to fully understand the answers obtained, it should be taken into account that the average net monthly salary in Serbia in 2019 was 457 EUR and in Sabac 433 EUR. This means that the share of heating costs in relation to the average net salary, on an annual level, was 10.35% in Sabac and in relation to the average in Serbia 9.81%.



**Figure 69 - How often consumers think about heating system or possible changes to the heating system**

Of course, high heating costs motivate owners to think about possible changes or replacements of old and inefficient heating systems by looking for cheaper alternatives - often (26.47%) and in winter (29.41%). The results of the survey show that a large number of consumers do not set this question as a priority - never (8.82%), rarely (17.65%) and not often (17.65%). It should also be taken into account that slightly less than 18% of the surveyed consumers live in households connected to district heating and there are not too high expectations that they can replace their heating system. This group is focused on the local energy company and the projects the company is developing.

More than 60% of households did not change the heating system. The households that did that made the replacement in the previous 2 to 7 years. The reasons why they decided to replace their heating systems were:

- High operational costs of the old heating system,
- Easy and simple operation and control of boilers,
- Control of heating system according to own habits,
- Less environmental pollution,
- The old boilers were inefficient,
- Breakdowns became more frequent and maintenance became expensive.

All consumers who replaced the boilers agreed that they did so primarily because they were dissatisfied with the cost of heating and the increased number of failures following the age of the boiler.

Excluding consumers already connected to the district heating system, only a small number stated that they would like to connect to the district heating system (29%) and the rest (71%) do not want to use district heating. The reasons given are as follows:

- Satisfied with the existing heating system (25%),
- They do not want to depend on the mode of operation of the local energy company (35%),
- Heating costs are too high (40%).

However, after talks within the local working group of the project, representatives of one of the settlements on the outskirts of Sabac expressed interest in small district heating networks with a wood-fired boiler. A special campaign is planned for this group, which will include a location with 200 single-family buildings. The characteristic of the location is the high density of buildings, which should mean lower investment costs calculated per household, but also lower losses during operation. The topic of conversation will be the business and financial model, and the citizens are referred to the partnership with the local energy company.

### Consumer criteria to select a certain technology

According to the survey participants, the most important criteria are the amount of investment and heating costs during operation (76.50%). Owners of individual heating systems prefer automated systems and devices such as natural gas boilers, pellets and heat pumps. In addition, it was pointed out that if new devices are installed, preference will be given to environmentally friendly technologies. It should be noted here that the opinion of users is that the use of natural gas and the purchase of highly efficient gas boilers is an acceptable option, especially if the replacement of old boilers with coal or heating oil. The owners of coal-fired boilers and old wood-fired boilers pointed out that they are interested in clean technologies and that the use of coal and oil boilers that emit dust, soot and other pollutants into the air is unsustainable in the long run.

Younger consumers have stated that they would like modern devices with implemented IT solutions that would enable them to control the heating system via mobile applications. However, there were no answers in the survey that would lead to the conclusion that this is a criterion that influences the choice of heating technology.

### The consumer perception on whether climate friendly systems increase their home value

Consumers believe that a climate friendly system will increase the value of their home (79.41%). This claim was especially emphasized by the owners of apartments in multi-family buildings who participated in the project of thermal insulation of buildings, which has been implemented in Sabac since 2010. They say that the demand and value of apartments in those buildings on the real estate market has increased by an amount that is significantly higher than the investment.

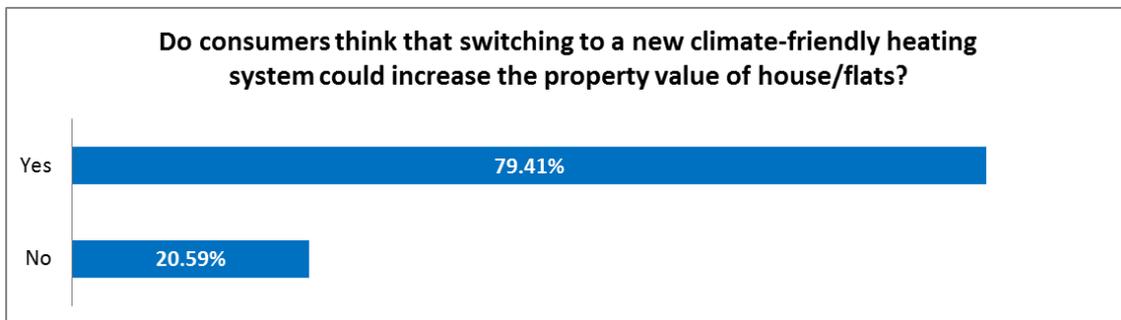


Figure 70 - Consumers' opinion whether switching to a new climate-friendly heating system could increase the property value of their house/flats

It should be noted that real estate agencies especially emphasize the fact that the buildings and apartments that are offered are energy efficient and that they use modern technologies for heating, which includes the use of renewable energy. Apartments in these buildings sell faster, despite the fact that the prices are slightly higher compared to traditionally built buildings. This is a trend that has been visible in Šabac since 2016, when the first multi-family and business buildings were built, in which heating installations with water-to-water heat pumps were installed.

Negative answers were given by the owners of thermal non-insulated buildings, which leads to the conclusion that high energy consumption does not motivate property buyers regardless of whether the system is climate friendly because the costs of space heating and sanitary water are still high.

### Consumers' opinion on boiler replacement

According to the answers from the survey, the best promoters are neighbors and friends (33.33%). Decisions on the choice of heating technologies to be used instead of existing systems and devices are based on examples of good practice. Citizens also trust experts in the field of heating (23.81%), energy advisors and designers. Of course, the decision to replace the heating installation is made within the family, so the opinion of family members is very important (16.67%).

However, the opinion on the replacement of the heating system is not sought by everyone (14.29%), which can be explained by the mentality of the population in this area.

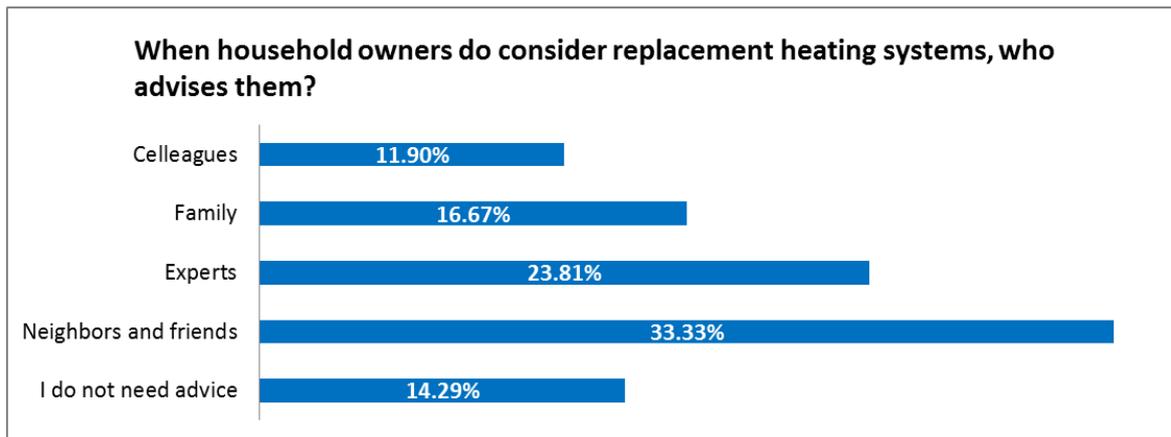


Figure 71 – Who advises householders when they do consider replacement heating system

### Arguments and issues against switching to a climate friendly heating systems and/or buying them

The amount of investment costs (56%) and the payback time of the investment in climate friendly heating systems (15%) are the reasons that demotivate consumers to make the decision to replace the existing heating systems. The lack of subsidies and credit lines with relatively high interest rates and short repayment periods demotivate homeowners to invest in new heating systems.

Favorable conditions for financing the connection to the distribution gas pipeline network in Sabac have contributed to the growing use of gas boilers and consumers who use natural gas have stated that they are satisfied with their heating systems (15%).

The survey showed that some citizens simply do not have arguments against replacement (11%) and do not believe that existing heating systems have any impact on climate change and the environment (3%).

### Information sources and channels which consumers uses

As already mentioned, the information that citizens are interested in are investments, operating costs and examples of good practice. Younger and middle-aged consumers usually get information via the Internet, but they gladly visit workshops and presentations of equipment manufacturers and retailers. Energy fairs and similar events are also in the focus of their interest.

On the other hand, older consumers prefer direct communication with experts and installers as well as with neighbors and friends who have experience with replacing old and inefficient heating systems. A significant source of information is the media, especially electronic (local stations and national TV).

The local energy company in Sabac has decided that all interested citizens can come to the company's premises and through a conversation with the heating plant staff get all the necessary information about heating systems and implementation of energy efficiency measures to make informed decisions about participation in projects implemented by the company and to be informed about modern and more efficient heating and cooling technologies. A step in this direction is the intention to establish the Academy for Renewable Energy Sources and Energy Efficiency, as in direct contact with experts, citizens will receive all the necessary information about the replacement of old and inefficient heating systems and the benefits of new renewable technologies.

### **Experiences with installers, maintainers, etc.**

In the event of a fault in the heating installation, householders turn to the installers and service technicians of the boilers (95%), but they are also trained to eliminate the faults themselves (5%). In multi-family buildings, apartment owners turn to building managers (50%) but also directly to the local energy company (50%). Multi-family buildings are specific because there is a shared responsibility. Malfunctions and improper operation of the equipment in the heating substation is the responsibility of the energy company, the joint heating installation is the responsibility of the residential community and that is the reason why the tenants turn to the building managers. Heating bodies (or cooling terminals) are the personal property of the apartment owner, so tenants or apartment owners solve problems either with the installers or seek the help of the building manager or the help of the energy company's staff.

Consumers trust installers and service technicians (90%) because they have made contact with them, most often on the recommendation of friends and neighbors. However, there are also opposing opinions and negative experiences (10%). The quality and expertise, especially of boiler servicers, is at an enviable level and the only complaint is the response time, which most respondents think is slow.

Although they usually do not ask for additional services other than device repair (89%), consumers say that they gladly accept the advice and recommendations of service technicians and installers (11%). Owners of gas boilers must perform regular annual inspections of their boilers before the heating season. For this reason, device failures are extremely rare.

### **Information that consumers would like to have regarding the renovation of their heating system by a more climate friendly one and their opinion on how to make boiler replacement more interesting**

Traders and manufacturers of boilers and other heating equipment offer technical information via the Internet, but it is also necessary to organize the presentation of products and services through direct contact with citizens. Trainings and workshops for those interested should be supported and organized by the local community. It is very important to have consumers who have already replaced their old and inefficient devices with new biomass boilers or have installed heat pumps. Examples of good practice supported by specific data on investment, operating costs and device quality are information that motivates consumers who are considering replacing their heating systems. The survey showed that it is very useful to organize info points in public buildings where a large number of people gather every day due to the nature of public services offered to citizens in those places. The proposal is to make available info materials (flyers, catalogs, offers of banks for financing energy efficiency measures and new heating devices) at these points. In addition, there is an interest for the local administration to provide information through the media on support mechanisms, subsidies and other incentives within its competence.

Information on energy consumption and savings achieved after the implementation of energy efficiency measures (thermal insulation of existing buildings in Sabac) contribute to the successful implementation of collective actions of this type. Collective actions are supported by all apartment owners in multi-family buildings.

The construction of a small district heating network in the settlement "Letnjikovac" in Sabac is an example of good practice on the basis of which a group of citizens from the neighboring settlement "Kasarske livade" launched an initiative to make a techno-economic analysis and check the sustainability of such a model in this settlement. The support of the local energy company and the joint investment of the citizens and the company are expected. Obligations would be divided in such a way that the citizens living in this location build a district heating network and that the energy company installs a plant with a wood-fired boiler and delivers heat substations with heat meters for each building individually.

One of the interesting ideas was to join an energy cooperative whose members would provide joint procurement of wood chips for the needs of a small district heating network as well as wood pellets for household boilers. It is expected that the fuel procured in this way would be cheaper, but it would also give local forest owners a chance to provide wood from which wood chips would be prepared.

The conclusion that can be deduced from the analysis of the answers obtained in the survey is that the local community is expected to establish two-way communication channels to citizens by disseminating information and taking activities to inform citizens and educate about efficient and climate friendly heating and cooling technologies, as well as to be open to citizens and their demands to subsidize and encourage in other ways the replacement of old and inefficient devices.

## **1.11.3 Mindsets and interests of intermediaries**

### **1.11.3.1 Overview**

Following the recommendations of the competent institutions regarding the COVID19 pandemic, two meetings were held with mediators. Questionnaires were filled out by three people and a telephone conversation was conducted with seven people. The group of intermediaries consists of installers (also boiler servicers), heating installation designers (energy consultants), building managers, a representative of a consumer association, a representative of an NGO dealing with environmental protection and a member of the project team BioSol project promoting solar energy and biomass and implementation of green projects in Sabac.

There is no association of installers in Sabac, nor in Serbia. Installers find customers only on the recommendation of customers who have already installed boilers and heating installations. They are formally organized as entrepreneurs and at the same time they are servicers of boilers and heating and cooling devices. Contracts are most often tied to individual brands.

The designers are in a very similar situation. Formally, there are no energy consultants in Serbia, but experienced engineers and designers have that role. The designers are organized in the Chamber of Engineers at the regional and state level. They often attend trainings and workshops organized by the Chamber of Engineers in cooperation with representatives of equipment manufacturers or their authorized dealers.

According to the statements of the installers and designers, both groups have a high level of knowledge about climate friendly heating and cooling technologies. This is also considered by the representative of the NGO dealing with environmental protection as well as the representative of the BioSol project within which the promotion of green technologies is carried out. The goals of the Biosol project in

Sabac are the promotion of solar energy through the organization of workshops and other events as well as financing the purchase of eight smart solar benches, construction of a PV system with a capacity of 16 kW and a thermal solar system. The biggest investment within the project is the construction of a small district heating network with a wood-fired boiler to which six public buildings will be connected. The goal of the project is to establish the Academy for Renewable Sources and Energy Efficiency with the task of educating young people (primarily primary and secondary school students in Šabac), as well as engineers and installers through programs of various levels of expertise.

The representative of the consumer association and building managers are satisfied with the realization of the project of thermal insulation of multi-family buildings, which was organized as a collective action and which is an example of good practice on how to achieve energy savings. The significance of the thermal insulation of buildings project in Šabac is also the fact that a model has been created according to which collective actions can be financed.

All surveyed intermediaries stated that high investments, lack of favorable credit lines and lack of subsidies and other incentives by the state and local administration are barriers that need to be removed in order to accelerate the replacement of old and inefficient boilers with new climate friendly technologies.

The installers and designers also pointed out that the trend of installing wood pellet boilers in households is visible, as well as the installation of heat pumps of the water-water type in households and air-air (split devices), regardless of the way of living. Unfortunately, no statistics are kept on the number of installations performed. It was pointed out in the conversation that households located on the territory of the city where there is a distribution gas pipeline network most often opt for the installation of highly efficient gas boilers due to acceptable investment costs and low gas prices.

### **1.11.3.2 Fields of interest and general perception of consumer mindset**

#### **Field of RES-H they are focused and/or interested**

Unfortunately, there is no data on sold heating (cooling) devices that use renewable energy. Installers do not have their own association, do not update and do not exchange information about the devices they have installed or maintain. Energy management, which has been mandatory since 2014 for cities with more than 20,000 inhabitants in Serbia, focuses only on public buildings and the public sector.

According to the conducted survey, the mediators in Sabac stated that the citizens show the most interest in pellet boilers and heat pumps. One of the installers stated that during 2019 and 2020, the demand for PV systems and small wind generators in rural households for the needs of electricity supply of electric motor drives for heating devices and for the needs of agriculture (watering systems in fruit and vegetable growing) increased.

All respondents agree that there is potential for the use of solar energy to heat sanitary water and to support heating systems, but that there is no interest from citizens.

#### **What are for them the main benefits for consumers when installing a RES system?**

All surveyed intermediaries stated that lower heating costs are the benefit that motivates the owners the most, but also automated operation and simple management are the most frequently mentioned reasons for replacing existing heating devices. Environmental protection is an issue that interests buyers of new heating systems but is not crucial for decision making.

The installers also emphasized that PV systems are long-lasting, no special installation conditions are required, they are fully automated and do not require the engagement of the owner, maintenance costs are minimal. When it comes to PV systems, it is very important for users to be able to monitor and manage via mobile applications. PV systems are used to drive electric motor drives (pellet boilers), compressors (heat pumps), to drive circulating pumps in heating installations and automatic control.

#### **What are the barriers to consumers when replacing their old boiler with an alternative system?**

Investment costs, lack of subsidies and lack of favorable credit lines are barriers mentioned by all survey participants. Installers and designers (energy advisors) stated that citizens are not aware that the best performance can be achieved only in the case of low-temperature heating and that a prerequisite is that the buildings are well thermally insulated. In that sense, it can be said that the poor energy performance of existing buildings is a serious problem that citizens do not take into consideration when replacing their old boilers.

Building managers cited the problem of decision-making in multi-family buildings. A qualified majority must be provided for the implementation of any activity related to the common parts of the building, including the heating system. The problem of apartment owners in multi-family buildings is that they are invisible to the banking sector. Banks consider lending to the housing community to be high risk and do not approve loans for collective actions such as replacing heating installations in multi-family buildings.

Unclear legislation and technical regulations are currently insurmountable obstacles to the installation of PV systems in the case when installations and devices in households are simultaneously connected to the public network.

#### **What are the reasons why consumers are not satisfied with their current heating system?**

The most common cause of dissatisfaction with existing heating systems is the price of fuel, increased frequency of failures as a result of the use of boilers that are at the end of the operating period, as well as the need for a large space for fuel storage. Owners of buildings with coal-fired boilers complain about dust, soot and other harmful substances emitted by heating systems. Owners of solid fuel boilers also have objections to the handling of heating installations, the lack of automatic regulation, heating and ash removal, which requires a lot of manual work. Coal quality and high moisture content in split wood are problems faced by owners of solid fuel boilers and they are usually unable to change suppliers.

Apartment owners in multi-family buildings are dissatisfied with the mode of operation of district heating, which they cannot influence. Heating interruptions during the night are mostly complained about by members of the younger population and parents of small children.

#### **With how many counselling clients do you estimate that they will replace their old heating system within one year and if so, towards which energy source?**

It is very difficult to estimate the number of households in which the devices used for heating will be replaced during one year. The fact is that an increasing number of consumers make the decision to perform thermal insulation of their own building, after which they reconstruct the heating installation and replace the heating device. The installers estimate that the rate of increase in the number of pellet boilers and installations with heat pumps is 1% to 2% per year, which is 200 to 300 new devices per year for the territory of Sabac.

When considering the trend in the number of renewable energy users, one should also take into account the fact that the local energy company plans to build at least two small district heating networks during 2021 and 2022, to which an additional 300 households could be connected.

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### **What would consumers need to make it easier to convince them to switch energy carriers?**

The consumer's decision to replace their heating boilers is primarily influenced by information about the return on investment, the availability of authorized services, but also recommendations from friends and neighbors who have already made the replacement and examples of good practice that will be reported through the media.

Designers (energy consultants) believe that it is necessary to provide space and dates for conversations with consumers ("open door day") as well as "one-stop-shop" locations where consumers would receive all the necessary technical information, terms of purchase and financing models. Of particular importance is the support of the local administration, which is expected to participate more actively in replacement campaigns.

### **1.11.3.3 Business, experiences, market and training**

#### **What gives them more benefit, traditional fossil fuel heating systems or RES-H systems**

For now, installers have a higher turnover of services than the sale and maintenance of gas boilers. Sales and installation of pellet boilers show a growth trend because they are increasingly attractive for households that do not have the ability to connect to the gas network.

Individually, traders and installers benefit the most from the sale and installation of heat pumps, but the number of devices is not as large as the number of sold pellet boilers. When installing heat pumps, it is usually necessary to reconstruct the heating installation, which increases the volume of engagement of installers and brings higher earnings. Maintenance during the operation of heat pumps is simpler and it is possible to monitor the work via mobile applications or the Internet, which is recommended by the installers and which is an additional benefit for both users and service technicians. Very often, minor faults can be detected by diagnostics via a mobile application, which is supported by new generation heat pumps.

#### **Negative and positive aspects of heating for the consumer**

Positive aspects of the use of renewable energy technologies are automated operation of the device, easy handling, lower heating costs. Users emphasize that they are satisfied because they have solved the problem of ash removal, dust and soot emissions. In general, consumers have a positive attitude towards the use of renewable energy.

Users who did not take into account the fact that low-temperature heating is not applicable in buildings with poor energy properties believe that heating using a heat pump did not meet their expectations.

#### **Which is the main barrier they see for the consumer to finally install a new heating or cooling system?**

The main reason is the high investment in renewable energy technologies, the lack of subsidies and other support mechanisms and the lack of favorable credit lines. A large number of buildings are not adequately thermally insulated, so energy losses are as high as heating (cooling) costs. In such cases, large investments are needed in energy efficiency measures and replacement of heating systems. Without the implementation of energy efficiency measures, the payback period for replacing a heating installation is too long. On the other hand, if the heating system is replaced before the implementation of energy efficiency measures, which require seriously higher investments, the heating system is oversized, expensive and investments in energy efficiency measures cannot be returned within a reasonable period.

#### **Do they feel there is enough policy support at national and regional level?**

Political support exists but is not accompanied by financial incentives. The Assembly of the City of Sabac adopted the document Energy Policy of the City of Sabac. The document lists the priorities of energy efficiency, increasing the share of renewable energy, mitigating the effects of energy poverty. An "open door day" term has been introduced once a week. The last in a series of steps is the decision to establish the Academy for Energy Efficiency and Renewable Energy Sources, which will be available to primary and secondary school students, but some programs will be at the level of users / owners of heating (and cooling) systems.

#### **What do they think about collective actions, would they like to take part in promoting them?**

Collective actions are very useful and effective in the opinion of all respondents. Building managers pointed out that they have positive experiences with the thermal insulation project of existing multi-family buildings. In that sense, the intermediaries have a positive opinion in relation to the energy cooperative, which was established at the end of 2019. The energy cooperative could be the initiator of collective actions, but also a mediator between financial institutions and consumers.

In addition to supporting collective actions and the active participation in the energy cooperative, all intermediaries expressed their readiness to support and participate in collective actions.

#### **How could energy advisers and installers etc. help each other, by which means?**

Installers and designers (energy consultants) are still referred to each other. Citizens who decide to replace the heating (cooling) installation need designers, especially when reconstructing the heating installation and when permits and project documentation are required. On the other hand, consumers expect to receive information from designers on the quality and performance of heating and cooling devices, as well as to receive a recommendation on which installers they can hire. In that sense, the cooperation of both groups of intermediaries is necessary and useful for end consumers.

#### **In what they would like to increase their knowledge?**

There is interest in the use of solar energy, given that this technology is neglected in Sabac (generally in Serbia) and it is considered that there is a serious potential for use, especially for heating domestic hot water.

#### **Are professional associations supporting the RES systems enough, and if not, why?**

The Chamber of Engineers often organizes workshops on the use of renewable energy and examples of good practice, and organizes presentations of new devices and technologies.

#### **Where do they look for information about RES heating and cooling systems?**

Most information is available online, but installers, service technicians and designers are required to visit energy and heating and cooling fairs. Assistance in contact with end users is also the distribution of information through flyers and electronic media.

## **1.11.4 Mindsets and interests of large investors and project promoters**

### **1.11.4.1 Overview**

Following the recommendations of the competent institutions regarding the COVID19 pandemic, a meeting with mediators was held. Four questionnaires were submitted by e-mail and in two cases a telephone interview was conducted.

The local energy company is developing projects that increase the share of renewable energy in the district heating system. In addition, it plans to invest in small district heating networks that use renewable energy and is open to joint investment with citizens through collective actions or partnerships with other investors, including citizens who are members of the energy cooperative. From January 2020, the company invests in the development of its own system, which means that building owners who plan to connect are not obliged to pay any costs for connecting their buildings. The company aims to replace natural gas with renewable energy by 2050 (wood chips, heat pumps that use wastewater from municipal water and groundwater treatment plants). It is also planned to take over part of the energy as waste heat from cogeneration plants owned by private investors that are being built in Sabac.

Investors support the energy company's plans and are interested in connecting new multi-family and office buildings to the district heating network. Investors expect heating (and cooling) costs to be sustainable, which will contribute to increased demand for apartments in newly constructed buildings. Investors also point out that buildings that are being built are energy efficient and that green building concepts are becoming more and more popular in the real estate market, and that access to financial institutions that finance the construction of new buildings is facilitated when heating and cooling installations are planned.

Investors understand the importance of promoting renewable energy, support the organization of public gatherings to promote the use of renewable energy and are interested in participating in workshops and trainings, although they believe they have sufficient knowledge about renewable energy and modern technologies. The concept of smart buildings and net-zero energy buildings (NZEB) is especially emphasized.

#### **1.11.4.2 Fields of interest and general perception of consumer mindset**

##### **Field of RES-H they are focused and/or interested**

Investors are interested in the use of wood chips, geothermal energy (groundwater), solar energy. There is also interest in connecting new buildings to the district heating network that would use some of the listed forms of renewable energy.

The local energy company, which is responsible for the development of the district heating system and invests its own funds in heat sources and network development, is preparing project documentation for a 5 MW wood chip boiler plant and a 7 MW heat pump plant feasibility study. The heat pump will use wastewater from the municipal wastewater treatment plant, which has been operating in Sabac for 4 years.

##### **What are for them the main benefits for consumers when installing a RES system?**

The benefits that investors expect are: cheap fuel, high efficiency of heating systems, work automation and complete autonomy using IT solutions (SCADA and mobile applications), environmental protection using clean technologies.

Investors expect low maintenance costs and security of energy supply.

Heat pumps are simultaneously used for heating and cooling, depending on the period during the year, which reduces investment costs.

Investors emphasized that clean technologies and green construction facilitate access to the capital market and raise the value of real estate.

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**Which are the barriers for the consumers regarding the replacement of their old boiler by a RES system?**

Investors state the amount of investment as the biggest problem and the lack of space for storing equipment when it comes to wood-fired boilers. Legislation regarding the use of groundwater as a source of energy for heat pumps that would use multi-family buildings (including mixed-use buildings) is very complicated and often inapplicable.

From the perspective of district heating system operators, there is a problem of dust emissions in densely populated central parts of the city. The representative of the energy company believes that an acceptable solution is the construction of small district heating networks in suburban settlements, as well as the construction of new heat sources on the outskirts of the city and connection to the existing district heating network which distributes heat in densely populated parts of the city.

**Which percentage of consumers they perceive that will change soon (within 1 year from now) their heating system and by which new fuel/system?**

The plans for 2020 and 2021 include the connection of about 400 housing units in newly built buildings to the existing district heating network. In addition, the local energy company expects the connection of about 300 single-family houses to small district heating networks that will be built in 2021 and 2022. This means that the percentage of consumers who will use fully or partially renewable energy in the coming years is about 3.5% per year in relation to the number of connections at this time.

### **1.11.4.3 Business, experiences, market and training**

**What motivates them to use natural gas/fossil fuels instead of RES?**

Simple connection procedures and acquired habits of buyers and users of real estate are factors that give preference to the use of natural gas over renewable energy. Of course, this refers to locations where there is a built distribution gas pipeline network. In the last year, the recession as a consequence of the COVID19 pandemic has caused a reduction in the price of natural gas in relation to renewable energy. This is an additional motive that in 2020 and the following years, until the economy emerges from the recession, the use of natural gas will be favored in relation to renewable energy.

Apart from natural gas, other fossil fuels are not used in district heating in Sabac.

It should be noted that 7,500 apartments in multi-family buildings are connected to the district heating system and that the possibilities to disconnect from district heating are very limited and impractical in practice.

**What is their range size of investment (from xxxx € to yyyy €)?**

Investors who intend to build independent heating systems in residential and commercial buildings are planning investments of up to EUR 100,000 per building. Investors who plan to connect buildings to the district heating network owned by a local energy company do not plan additional investments because it is the subject of an investment by a local energy company. In January 2020, a decision was made that investors would not finance the development of the district heating network, but that it would be the obligation of the local energy company (in public ownership).

The local energy company plans to invest EUR 200,000 and EUR 300,000 in 2021 in wood-fired boilers in small district heating networks at two locations in Sabac. For 2022, an investment of EUR 2,500,000 is planned in a heat pump plant that will be included in the existing district heating system.

**Negative and positive aspects of providing consumer with RES heat instead of traditional fossil fuels**

The positive aspects of the use of renewable energy are efficiency, automation, the possibility of using IT solutions as well as security of energy supply. An important positive aspect for property owners is the use of clean, climate friendly technologies.

For the district heating system operator, low operating costs and security of supply are in the foreground. In Sabac, there is a logistics center for the supply of biomass (wood chips) with a capacity of up to 60,000 t / a. From this center, it is possible to supply other cities in the region.

The negative aspects are the amount of initial investments and complicated procedures when it is planned to install a heat pump of larger capacities. Hundreds of kW heat pumps require adequate electricity infrastructure, which can be a problem in densely populated residential areas.

### **Which is the main barrier they see for the consumer to finally install a new heating or cooling system**

Investors believe that the biggest problems for consumers are the amount of investment, access to financial instruments, the way of decision-making in multi-family residential buildings as well as the habit of using traditional technologies (chopped wood and natural gas).

They also think that better communication with consumers and better information on the importance of using renewable energy is needed in order to mitigate the negative consequences of climate change.

Thermal insulation of buildings plays a significant role and investors believe that the implementation of energy efficiency measures must be harmonized with campaigns to replace heating systems.

### **What do they think about collective actions, would they like to take part in promoting them?**

Thermal insulation of existing buildings in Sabac, performed as a collective action, showed that this is a successful model for replacing old and inefficient heating systems. The attitude of investors is that collective actions should be initiated by consumers as well as local administration. They have a very positive opinion about the model of uniting citizens in energy cooperatives.

The local energy company supports collective actions and has adapted some of its current activities for the needs of the thermal insulation project of buildings connected to district heating. The local energy company took over the ESCO role and provided credit to finance energy measures. Consumers who own apartments in the buildings included in the project are able to use air-to-air split devices for heating (and cooling) for most of the year and only use the district heating system for a short period of the year. It is one of the ways to increase the share of renewable energy in existing buildings but also a good model for new buildings.

## **1.12 Slovenia**

### **1.12.1 Main conclusions**

Three target groups (end consumers, intermediaries, and investors) were interviewed with the aim to collect opinions and experiences about renewable heating and cooling and to lay the groundwork for future activities within the project, such as developing engagement tools and regional replacement campaigns for different target groups. Interviews with target groups were conducted in the period May-July. Overall, 38 interviews were conducted in this report sums up their opinions, respectively. Due to the established national measures related to COVID-19, it was not possible to organize focus groups with stakeholders. Stakeholders expressed their opinions and interests through questionnaires

and individual meetings. In return, solar energy power banks were procured and each respondent received one.

All target groups expressed a similar attitude towards benefits and obstacles of replacing the inefficient heating system and possible reasons behind discontent with the existing heating system. As one of the **main benefits** were recognized:

- financial savings,
- environment-friendly alternative,

while on the other hand **main obstacles** against installing a new RES heating system are:

- large investment costs
- technical difficulties to install a new heating system

The dissatisfaction with the existing heating system stems from high energy consumption. Further issues against replacement old heating system with one based on renewable energy is the market competitiveness of the fuel-based boilers. People replace their old heating system mainly when the old system is broken down. People face with the fact the energy price for fuel oil and natural gas is relatively low and furthermore, Eco fund offers subsidies for condensing gas boilers, connected to the gas grid, of 50 % investment. This leads to short-term and less informed decision based on the economic aspect.

Information sources used by most of the interviewees, in all three target groups are online sources, professional literature, educational workshops and conferences organised by relevant institutions. Some of the companies in the target group Investors have educational showrooms on their premises which the interested end consumers, clients and installers can visit and find out more about available technologies and options of installing a specific system in their home.

Collective Actions were perceived positively by consumers and investors, however not completely by the intermediaries. Here, open communication about this type of organisation form should be considered. Consumers need to be informed more comprehensively, but also in a transparent way. If the pure heating costs would be shown together with life cycle costs, then for example district heating is an economic solution with often satisfied consumers.

## 1.12.2 Mindsets and interests of consumers

### 1.12.2.1 Overview

The low price of fossil fuels is the reason why many households in Slovenia still heat with fuel oil systems, even though they are wasteful and burden the environment. It is a consolation to many that they can always point the finger at solid fossil fuel or biomass systems, which are most at the mercy of ecologists due to the release of particulate matter (PM) into the environment. However, they are mistaken: modern biomass stoves have such a proven firebox and all the components that they can be easily compared to the cleanest systems. In addition, their fuel comes from renewable sources (forests), which is why they are very numerous. And the interviewees done in the scope of this task show the Slovenian consumers are slowly being aware that the trend is turning, the future of heating system lies in exploitation of renewable energy and most importantly – they're beginning to be proactive.

Currently, by far the most popular are heat pumps, which can be a replacement for an old heating system or part of more complex systems in energy-less or passive buildings. As demand for all types of heat pumps (which capture heat from air, ground or water) grows rapidly even at a time when the price of liquid fossil fuels is not high, their manufacturers can hope for additional momentum in sales at the first significant rises in black gold prices.

The mindsets of the consumers captured in this chapter and carried out in the scope of Task 3.1 summarize the opinions of 18 people. Key challenges for the implementation of RHC replacement are:

1. Better awareness of end-consumers for more informed decisions.
2. Ensure continuous incentives programmes.
3. Regulatory provisions that give a clear planning horizon and milestones for a complete phase out of fossil fuelled and inefficient heating systems.
4. Further education of installers and chimney sweepers.

### **1.12.2.2 General benefits, barriers, concerns and expectations**

The general opinion is that the replacement of old, inefficient boiler should result in lower costs for heating and preparation of domestic hot water. Considering the possible subsidies for boiler replacement in Slovenia, which can present 40 – 60 % of the investment, the economic aspect is the main driver when dealing with boiler replacement in households.

The replaced technologies installed in single and multi-family buildings are mainly dictated by the targeted public call by Eco fund, which offers subsidies for technologies that exploit RES. Higher subsidies can be granted in cities with valid Air quality ordinance. The majority of interviewees (78 %) thus knows that the most economic and environment-friendly solutions is either biomass boiler or a heat pump in sparse areas, while in densely populated area the households can choose between heat pump or a connection to the district heating grid.

The main benefits for using RES technologies for the replacement of old heating systems recognized are (1) favourable investment (considering the possible subsidies), (2) low heating costs in the long term, (3) low effect on the environment.

On the other hand, the main barriers for replacing old heating system with one based on renewable energy are indirectly connected with the main benefits. 22 % of the interviewees do not see greater benefits of renewable energy sources, they state the main obstacle are high investment in RES technologies and thus long payback period. This indicates incomplete or partial knowledge of using such technologies for heating and the possible financing scheme available to them. The same group of people are also unaware of the benefits that Eco fund is providing to them, most importantly subsidies and unbiased advice from experts at energy advisory offices that can be found in 55 municipalities. This further emphasizes the fact the households need better tools in order to be fully informed and can made the best decisions when replacing old heating system.

In energy renovations of multi-family buildings the consumers can run into three major obstacles. One of the main issues in heating system replacement in multi-family buildings is consensus of the apartment owners. A 75 % consensus is needed and thus present a major challenge in old buildings, where in the group of many apartment owners only one can block the entire replacement or renovation works, due to disinterest or inability to finance energy efficiency measure. Eco fund does offer 100 % of subsidies for households who are dealing with energy poverty, but this did not prove to be a major obstacle against carrying out the energy efficiency measures in multi-family buildings. Another obstacle that they can encounter, but which is characteristic of all buildings built in older period, is that the apartment owners are not also the owners of the plot around the block. The plot is usually municipal and the municipality cannot and must not donate it to the apartment owners. This

problem is already being solved by the law on the registration of condominiums, but the procedures are lengthy. The third obstacle is rigid legislation, which does not provide for such comprehensive renovations. If consumers want to obtain a building permit for the expansion of a building, the project must treat the entire building equally, including its existing part. So they have to prove that the old part of the building will also comply with all applicable standards.

The consumers are aware and follow the advice by the energy experts that keep repeating the energy renovation of every building must be carried out comprehensively and mandatory on the basis of a project made by a qualified expert. If measures are taken, including the main thermal insulation of the envelope and the replacement of windows, followed by the installation of a ventilation system and only at the end the modernization of the heating system, the savings in energy use for heating and cooling will be biggest. Living comfort in the building will also increase. Should the households follow this steps respectively, the investment rises drastically and this represent a major issue, especially in multi-family buildings.

Further issues against replacement old heating system with one based on renewable energy is the market competitiveness of the fuel-based boilers. People replace their old heating system mainly when the old system is broken down. People face with the fact the energy price for fuel oil (80 EUR/MWh) and natural gas (55 EUR/MWh) is relatively low and furthermore, Eco fund offers subsidies for condensing gas boilers, connected to the gas grid, of 50 % investment. This leads to short-term and less informed decision based on the economic aspect.

Should the interviewees replace their old heating system with one based on RES, all the responses indicate the solutions that are inline with national heating guidelines. In densely populated areas, households are inclined to be connected to the centralized heating system or installing the heat pumps, while on sparse areas the alternative in biomass boiler is attractive and favourable. Nevertheless, only 17 % are actively considering and gathering information for the replacement of old heating systems with a new one due to boiler inefficiency or due to the fact their system is outdated.

### **1.12.2.3 Attitudes, channels and preferences**

Heat pumps are probably the most common form of heating for investors in a new, replacement or supplementary heating system. A technologically attractive, clean and fully automated form of heating (air/water, ground/water or water/water) has advanced the most in recent years compared to other systems. The relatively high initial investment is expected to be offset in a few years by low operating costs, which are more favourable due to improved performance from generation to generation, even in increasingly harsh temperature conditions and in facilities with a less favourable location.

Although in the long run, ground/ water type heat pumps are much more favourable, the vast majority of users prefer the air/water type, which requires less intervention in both the environment and the finances. In the first case, we have to distribute water on a plot near the house at a relatively large width or depth, which then uses geothermal energy. For the air/water system, a slightly larger space in the yard is enough to install the exchanger. The consumers are also aware that in recent years, a model for renting heat pumps has been established in Slovenia. This scenario, the costs of installation and maintenance in exchange for the monthly rent are fully borne by the provider. The consumer recognize heat pump's:

advantages:

- low operating costs
- easy to use
- environmental friendliness

disadvantages:

- relatively high initial investment (including subsidy)
- probable increase in the price of energy (electricity)
- dependence on (outage) of the electricity network
- great influence of the "natural conditions" of the building (location and orientation)

The main information source where consumers can find the most information regarding the heating and system replacement is the internet. There are many web portals that offer professional articles regarding the heating replacement. The most stand-out portals are Delo&Dom (<https://deloindom.delo.si/>) and Trajnostna energija (<https://trajnostnaenergija.si>). Energy advisory offices prove to be an important expert point, where households can get advise for consumer's specific situations. Based on the replies from the interviews it can be concluded that there's a need for a web-based central information point with relevant expert content about energy efficiency in buildings in general. Such portal should cover not only heating system replacement, but also renovation of the thermal envelope, checking air-tightness of the buildings etc. Many web-content are written by the investors or product producers, so household can quickly succumb to biased related content.

The choice of switching the heating system to a climate friendly heating systems depends on the situation. In cities where gas network grid is present, the situation is different than elsewhere. Natural gas is still a very interesting energy source to the consumers, as it is easy to use, install and more importantly – it's affordable, and it is environmentally friendly enough, especially from the point of view of dust particles, which are a big problem in Slovenia. Wood is problematic from the point of view of use, as it requires many additional steps in use, preparation of firewood / filling, storage space for pellets, manipulation, heat pumps can be problematic due to wells, since there's not enough information available where you're able to drill, where lie the water protection areas and furthermore, heat pump's noise proves to be problematic in densely populated areas.

The most important factors for heating system selection is the initial investment, maintenance, the complexity of replacing the entire heating system (e.g. from old fuel oil boiler to heat pump), CO2 emissions and long term costs.

In principle, there are no major issues with new constructors with installers, as the boiler is usually dimensioned correctly, the system control is clear, and so is the way the system works. Usually things work, but shortcomings arise when e.g. that the parameters for the operation of the heating system were not set according to the project or they remained at the factory settings. When renovating heating systems, the problem is that installers usually take on a design part that they do not understand. Because they do not know the dynamics of the heating system, heating needs, heating devices are usually connected in a similar way regardless of size, needs and heating system, which can lead to higher consumption, machine breakdown, etc. The difference between good and bad installers is in details such as properly lubricated thermal insulation, pipe distribution method, micro-location of equipment for easier maintenance, etc. They are good and bad servicemen. Service technicians often offer customers inappropriate solutions that do not take into account the new condition of the facility. In most cases, they offer a 1: 1 replacement, even though the facility has been thermally insulated in the meantime. Chimney sweeps do their job correctly (inspections, cleaning), there is a positive impact of competition in the quality of service provided and lower prices.

The main information the consumers would like to know, when deciding for the replacement of their heating system can be structured in three groups:

- (1) Economic indicators: investment and maintenance cost, payback period, subsidies
- (2) System control management: how often must the system be checked

- (3) System suitability to the specific heating needs: which system is the most convenient to the consumer's house

## 1.12.3 Mindsets and interests of intermediaries

### 1.12.3.1 Overview

The mindsets of the consumers captured in this chapter and carried out in the scope of Task 3.2 summarize the opinions of 12 experts: 4 installers, 4 chimney sweepers, 2 energy advisors and 2 architects.

Key challenges for the implementation of RHC replacement are:

1. Better awareness of end-consumers for more informed decisions.
2. Necessary education of installers and chimney sweepers.

The research was conducted through individual meetings and submitted questionnaires. There is a sufficiently developed market of equipment for heating systems in RES, however, the main obstacle is that the demand for such systems is still low and it is necessary to work through various projects and activities to encourage consumers in using renewable energy sources.

There is enough knowledge on the market, but the intermediaries believe that they need more new information about RES systems and a platform on which they can exchange knowledge and experiences.

### 1.12.3.2 Fields of interest and general perception of consumer mindset

The intermediaries' focus of work lies predominately in the heating system based on RES and chimney sweeping. In general, among all RES possibilities, heat pumps are increasingly dominating. End-consumers who already have easy and cheap access to a wood supplier (i.e. properties located in the countryside) tend to switch/stay to a system that uses split logs. The same can be said for the district heating grid, since the use of heating substation is justified from many aspects – economical and environmental, being the most important ones.

For the consumers, the most important benefit when installing the RES system is usually (1) more favourable cost aspect of operation and the ratio of the investment to other alternatives, (2), simplicity and reliability of system operation, (3) favourable environmental indicators and (4) the impact on the indicators of the new construction itself. These benefits have been recognized by the architects, engineers and installers. From the aspect of chimney sweepers, the consumer mindset is exclusively focused on rationality of the investment.

When it comes to the barriers, the consumer's decisions are often partial and short term. They strive to only boiler replacement and do not contemplate on long term solutions in combination with the building's features, renovation and needs. The technology market is constantly evolving and offers new, more efficient solutions day by day. The consumers are not able to absorb all the information, since they are flooded with information from leaflets, web portal and magazines with data, they only need to know once per 20-25 years. When they do need to know this is at the time of system replacement, and the information overload is giving them too little confidence in new technical solutions they do not know. Furthermore, many of them do not consult with an expert that could and should help them with more informed decision making. Chimney sweepers and installers recognize the issue that a lot of consumers find it difficult to operate new device after replacing it with RES heating system. A

significant information that consumers are hoping to get before the replacement, but in the end they mainly don't, are the costs for heating after the system replacement.

Intermediaries stress out the importance of working together with energy advisors as well. The visit to the energy advisory office has proven to be very beneficial to the consumers. What Slovenian market needs in the heating sector as a logical next step is cooperation between energy advisors, installers, chimney sweepers and companies that carry out the construction works. Consumers neglect the fact their heating system has aged and that it should be replaced, since they rarely think about apart from using it to heat their homes. This leads to postponing the decision until the system breaks down. Main reasons for being unsatisfied with the heating systems are a stated (1) high energy consumption, (2) negative environmental impact and (3) technical failures.

The low oil prices also do not provide consumers with enough incentive to switch the energy source, since it does not immediately make sense from an economic aspect. Due to the low oil prices, many consumers already filled up their storage, where they're able to save the fuel oil for 3-4 heating seasons. On a more positive note, the intermediaries have notices that beside the fact the consumers pile up their storage, they do not decide to actually buy a new fuel oil boiler. The sale of these has fallen dramatically in the past years, so consumers have mainly decided they're going to use the boiler until it breaks down.

In majority of cases the installers do not carry out the hydraulic balancing of the system, neither do they make annual inspection of the system and its control and regulation settings. This is defined at the installation stage only, from this point onwards the system is left to the consumer for management. The control and regulation can be in some ways managed through modern user interface on the systems itself, but such systems are usually more expensive and not a common choice for investment.

Consumers are usually consider replacement a few months before the heating season or when faced with expensive repairs and the inability to replace the boiler. Replacing the classic gas boiler with the condensation gas boiler requires chimney adaptation, which is a substantial investment on top of the new boiler purchase. However, installers highlighted a steady upward trend of installing new and more efficient heating systems, especially in the heat pump segment. This indicates a further potential rise of purchased renewable heating systems but remains difficult to determine exact share. Experience of energy advisers in the field has shown that the combination of incentives and subsidies, reliable and accessible information motivates citizens to invest in their heating systems.

### **1.12.3.3 Business, experiences, market and training**

100 % of the responses agree that the future of the heating system lie in RES-H systems. The main beneficial the installers and chimney sweepers see is easy control of regulation of those. Fossil fuel based boilers are complicated and when such system break down, the consumers tend to improvise and repair the system on their own, which in the majority of cases only worsens the situation. The main obstacle against more extended installation of those is the investment.

All of the intermediaries asked agree there's enough financial support on national and regional level. Eco fund offers subsidies for investment that improve energy efficiency of the buildings on a national level, but on a local level many municipalities already offer their additional subsidies for similar or the same measures. Such municipalities have usually problems with air quality in densely populated areas and see this measure as one of the possible solutions how to improve the situation. The main and big gap lies in awareness raising. 10 out of 12 believe the end-consumers should be better informed, but do not see their role as the one that could and should improve the situation and drastically reduce the gap.

Although the energy advisory program in Slovenia is free and running from 1995, many end-users do not know about this service or the advice of the energy advisors is not implemented. The energy advisors invest a lot of time and energy into these services, but the proposed solutions often remain only on paper and are postponed or never implemented as recommended. One of the suggestions for improving the situation, that arose from the interviews, is the obligatory visit to the energy advisory office before implantation of the energy efficiency measure before obtaining the subsidy. Such measure would definitely increase the demand for energy advisory experts, but would ensure the correct implementation of the measure.

The installers gather most new information on the annual training from the manufacturer or equipment supplier. Otherwise, new contents can also be discussed at seminars, meetings and fairs. However, turnout at these events is very low, which is worrying. Installers are currently faced with the problem of limited apprentices, because young people are not interested in learned manual professions. The question of whether companies are able to meet increased demand should always be considered, especially in the future with even fewer staff. High-quality young talent would be the most important for the industry to maintain quality over the next few decades.

Concerning the collective actions and taking part in their promotion, 10 out of 12 intermediaries expressed their negative attitude. They would be more than content to promote and present the collective actions, but should they see a collective action from other intermediaries – they believe the economic interest of a certain favored system by the provider (usually a retailer) would be ahead of other advanced systems. Collective actions were perceived to be useful as long as they focused on simple products and projects, and they should cover systems from variety of manufacturers.

Most intermediaries welcomed the idea of an all-around carefree package that would be developed together by the public administration in cooperation with technology providers, since it would lessen the burden for all participating parties. However, some intermediaries expressed their concern about the viability of such a package solution for difficult technologies, since many end-consumers rely a lot of “word of mouth” (i.e. experiences of friends, neighbours, etc.) and on existing relations with installers. It would probably be easier to implement for easier technologies or products, like the sourcing of pellets. Such one-stop-shop packages must be attractive for the installers and manufacturers (and other stakeholders, e.g. chimney sweepers) alike, otherwise it would be difficult to convince them to participate. In particular, installers in the heat pump business such good market conditions that convincing them to improve or expand their offer might be challenging. One suggestion was to supervise certain projects together and to align communication. This idea was proposed a while back with some campaign days, but despite a large number of media reports, the overall interest remained low. Many installers and manufacturers are already so busy, which makes it next to impossible for them to attend events and trainings and discussions on such packages. More direct and consistent communication is needed in order to reach people who are generally disinterested.

## **1.12.4 Mindsets and interests of large investors and project promoters**

### **1.12.4.1 Overview**

The survey among investors was conducted with the participation of 8 respondents. Investors are most interested in heat pumps, centralized heating systems, solar systems, systems based on wood, pellets and wood chips as energy sources. As the main advantages of RES systems investors point out environmental acceptability and constant energy supply.

The biggest barrier to the switching to RES systems is their financial aspect, i.e. the cost of investment and existing energy price for fossil fuels. This is precisely the reason that motivates them to use/stay on gas/fossil fuel boilers, in addition to already well-established procedures for the installation of gas boilers and obtaining permits, a higher degree of safety in the operation of gas boilers and ease of use. Investors' opinions on the number of users who will change their heating system during next year are divided.

On a local level the interviewees believe around 5 % of the households are going to replace their old heating system with a new one. Although it is expected COVID-19 will have a negative impact on the overall switching from fossil fuels to renewables, this is not expected for centralized heating systems due to relatively low investment cost considering high share of subsidies (50 %).

#### **1.12.4.2 Fields of interest and general perception of consumer mindset**

Respondents aim to contribute to the renewable future in the heating sector. Their main interest are heat pumps (3 out of 8), biomass boilers (2 out of 8) and centralized heating systems (2 out of 8) and energy management on a local level (1 out of 8). Companies tend to be mainly oriented towards manufacturing and installing heat pumps and other efficient heating systems (heating substations, condensing gas boilers). However, firewood, wood pellets and solar energy remain represented. Typical companies from this group develop medium to large or very large projects, from few hundred thousand euros to several million euros.

As with other two target groups of end consumers and intermediaries, financial savings are seen as the main benefit of replacing the existing heating system. This is followed by positive impact on the environment in comparison to using fossil fuels, renewable energy source, efficiency of modern wood biomass boilers in the form of outdated technologies, own energy source, less dependence on foreign energy producers and suppliers. Other benefits include government subsidies, the safety of the tenants due to the new and improved systems.

On the other hand, main barriers relate to the fact the existing heating systems are mostly high temperature system. Since most RES systems work better in a low temperature system, this issue needs to be resolved before the installation of RES system. Furthermore, users do not extend the operating schedule of the RES device because they are accustomed to short-term operation with high thermal power (fossil fuel boilers), the initial investment in RES system is higher than plants that use fossil fuels and due to the continuous operation of several devices (collector, heat pumps, boiler), a more complex system room operation can occur.

Consumers are usually attentive to their heating system only when it starts to wear down and possible damages to the boiler can occur. Further reason for dissatisfaction with the boiler are connected to the basic control of the system, poor efficiency of the device and high costs of purchasing energy, incomplete combustion and accumulation of soot, obsolescence and consequently more work with operating and servicing the device. Other reasons include maintenance costs, unfavorable environmental footprint, difficult regulation of room temperature if connected to a central heating system and lack of knowledge, which was also mentioned as one of the obstacles. Lack of knowledge refers to the lack of consumers' awareness of the new system benefits gained in the long-term and therefore it is identified as one of the barriers from the companies' perspective.

On a local level the interviewees believe around 5 % of the households are going to replace their old heating system with a new one. Although it is expected COVID-19 will have a negative impact on the overall switching from fossil fuels to renewables, this is not expected for centralized heating systems due to relatively low investment cost due to high share of subsidies (50 %).

### **1.12.4.3 Business, experiences, market and training**

The main barrier against installing a new system is a fact they're are not cheap, and old ones still (partially) work. In some cases, it is necessary to rehabilitate or install a new flue gas outlet for condensing boilers. In apartments on the same vertical with a common chimney, all boiler owners must decide to replace the boiler at the same time. There's a noticeable seasonal impact as well: the peak of demand is in the autumn before and at the beginning of the heating season and in the spring. Some customers want to keep the old system connected in parallel as a reserve, or they still have to use fuel oil. Some other barriers relate to lack of available information on new systems and insufficient trust in efficiency of the new system that would result in lower heating costs.

The majority (5 out of 8) believe the Eco Fund contributes an important part to supporting households to replace their heating system, and is currently less effective in promoting businesses. For companies, support through investment tenders for investments by various ministries has sometimes been very effective, but is currently not available, except for district heating systems, which have a very limited scope of real feasibility.

In 75 % cases the investors would be interested in participating in collective actions. In the case of purchases/sales of modern technology, where the only and most important factor is not exclusively the lowest price and which is realistically verified and technically harmonized and is not thrown into the same basket of seemingly comparable technology, which in practice shows noticeable differences between real operations and paper documentation. All investors believe that collective actions are useful for raising public awareness. They point out that the support of local authorities is key to the promotion of new technologies and greater use of RES.

Some companies already offer packages of solutions as a replacement of old boilers with new condensing gas boilers, whereby orders are obtained exclusively on the basis of professional advice from sales consultant. One company already offers 14 packages and a few sub-variants, which amounts to more than one hundred and fifty packages. Even a public company in this case is obliged to select bidders and contractors in a public tender, and sales consultants must know the details of various packages and individual pieces of equipment in order to be able to advise customers on a specific situation. Public administration must limit itself to general counselling within the energy advisory network, which should be expanded and brought closer to people by offering advises at home.

Main source of information for potential end-consumers is available on websites and all of the interviewed representatives from companies have educational showrooms which the interested end consumers, clients and installers can visit and find out more about available technologies and options to install a specific system in their home.

Companies regularly organize workshops to educate the installers on the equipment specification, as well as the installation know-how. Interviewed representatives find this to be one of the crucial segments, which indirectly leads to building better customer experience. On the other side, interviewees stated that they learn about RES heating and cooling through conferences, fairs, clients who often approach them and ask whether they have certain technology, cooperation with research centers and professional literature.

## 1.13 Spain – Castilla y León

### 1.13.1 Main conclusions

#### Consumer group conclusions

The main benefit considered by consumers when substituting their old system by RES-HC is to protect the climate and environment, with a positive answer by 93% of the interviewers, while subsidies is seen as positive only by just over 50%. The main obstacle to replace their system is the investment cost – find it too expensive (71%) and the same percent claim that they are satisfied with their current heating system. Other barrier is that they feel is not technically feasible or would require too much effort and it would disrupt their daily life.

Consumers show interest in solar thermal energy (85%) and biomass (63%), while they claim to be aware of the environmental problems caused by non-renewable HC systems (73%) and the high price of fuel (60%). Half of the consumers would consider a RES system as an option for a renovation.

Consumers emphasize the reliability and the possibility to regulate their heating system, but on the other hand, they claim to pay more compared to other similar consumers, having a high price in their bills. They would change their system if there is a reasonable or big improvement in the RES system monthly bill compared to their current boiler.

When having problems with their system - 28% of end consumers indicate to have technical failures with their current system - half of survey respondents would inform to a technical service, 33% would notify to their home insurance or call a trusted technician (17%). Criteria that would most influence consumers when taking the decision to change their heating system is the replacement is carried out by a trusted installer or by an engineer.

67% of consumers believe that switching to a new more efficient heating system would increase the value of their house or apartment. The sources of information used when thinking about changing the heating system/energy source is frequently the information that can be obtained online.

#### Intermediaries group conclusions

The most common projects involve biomass systems (83%), followed by solar (58%) and aerothermal systems (42%). Cold and heat systems is mentioned by 25% and geothermal by 33% of respondents.

Intermediaries feel the main benefits for consumers when installing a RES system is to protect the climate and environment (92%) and the other main advantage is having an alternative to oil and gas. The main obstacle for the replacement is the investment cost which end-consumers find too expensive (87%) and might need much effort to replace.

The range of clients that intermediaries estimate will replace their heating systems in the short term is in the range of 1 to 25% (90% of answers included in this range), which means at least 1 of every 10 clients should do the replacement in the short term. Intermediaries consider it would facilitate to convince customers as being easy to use, reduction of the energy consumption, access to better financing, lower investment costs or lower energy cost (>50% of answers).

The policy support measures stated by the intermediaries which would help to increase the RES for heat are marketing campaigns, mechanisms to pay for CO2 emissions and frequent inspections are considered (>80%). Over 70% consider that also subsidies, public sector best practices, training to professionals or making financing easier would support it.

#### Investors group conclusions

Biomass heating systems is by large the technology used by most (100%) investors in heating and cooling, 50% use solar thermal energy, while other technologies as geothermal and other heating systems are used by some of them. They claim that climate and environmental protection, alternative use of energy, energy independency and security of supply are key benefits for consumers, while public subsidies are considered relevant by 50% of them.

They mention that consumers feel the barriers to use RES heating and cooling are due to investment cost (60% investors agree) and they are satisfied in great extent with their current system (60%). Furthermore, 40% mention that people think they might be too old to change their systems, it is not technically possible, or it will constitute much effort for them.

The risks associated to investments considered by investors are mainly (above 40% investors mention them) increases in the fuel (biomass) or electricity price regarding the RES system demand, reduced energy price for customers, reduction in the use of energy by customers, lack of regulatory stability and investment costs higher than expected.

Related to the weakness of investment projects, a bad definition of the consumption demand is seen as the main one (over 50% investors). Others as not clear roles of all companies involved, not enough information regarding cost increases, financing schemes, socio-economic impact assessment or low commercial work are important weakness. Technical definition, legal issues and prices for energy supplied are the lowest weakness.

## 1.13.2 Mindsets and interests of consumers

### 1.13.2.1 Overview

#### Consumers group description

The analysis of mindsets and interest of end-consumers has included a wide range of age groups. The largest share are people aged between 45 to 60, followed by people aged less than 45, and finally users whose age is over 65 years.

Distribution of interviewees is based too on their place of residence or working (urban or rural), just as the ownership of the place, if they are the owners or they rent the place.

The following figures show the exact percent of the age of the groups who participated in the survey, as well as the distribution of owner or rented population.

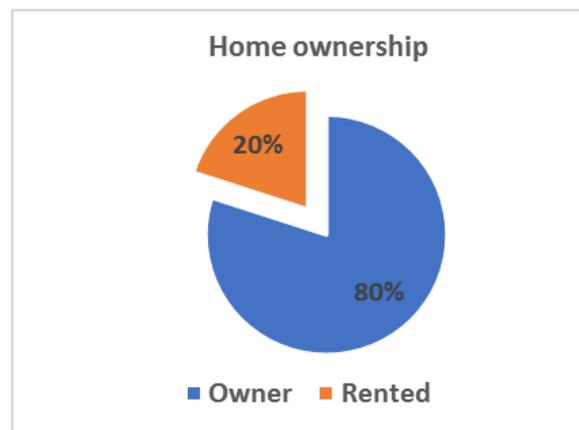
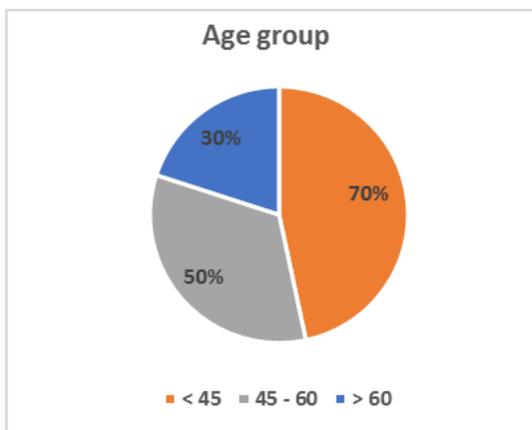


Figure 72 Age group structure of the interviewed consumers and owners-tenant share

Almost 2/3 of the interviewed end-consumers live in multi-storey buildings in an urban centre, with or without commercials on the ground floors. The rest of interviewers live in single-family homes in urban or rural areas, both groups represent an 17% of the total.

Figure 3 illustrates the distribution of the heating and cooling system used, where shows almost end-consumers use the system for heating (93%). Furthermore, a high percent (73%) use it for sanitary hot water too. However, few populations use the system for air conditioning (13%) or refrigeration (13%). It is due to in Castilla y Leon has a cold climate, so it is usually not necessary to use air conditioner or similar.

For these uses of their heating system, there are a huge share of interviewees who still use non-renewable energy (natural gas, diesel oil...). Although, 13% of end-consumers claim use biomass as energy source for their heating system.

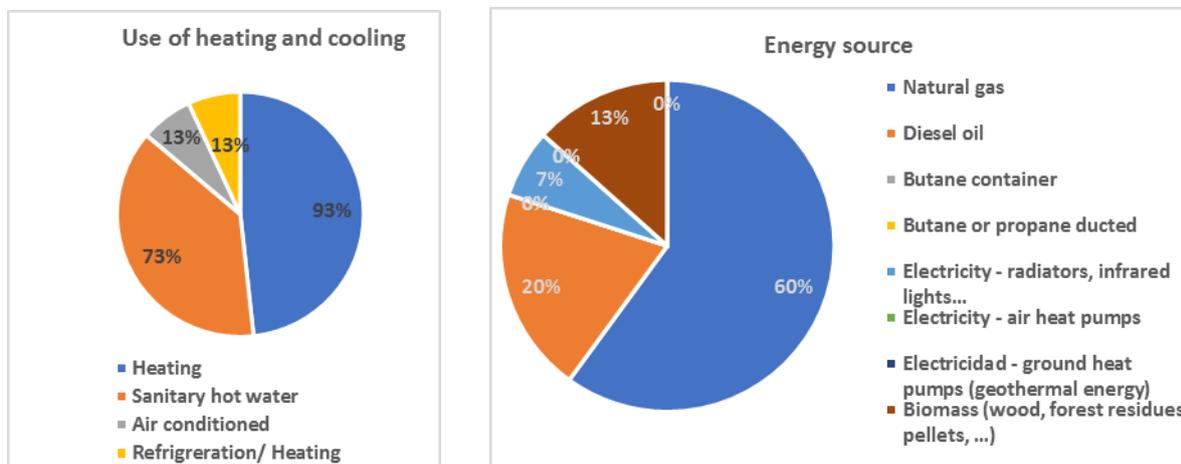


Figure 73 Structure of the heat and cold used and energy sources

### Consumer group conclusions

- Regarding the general benefits, barriers, concerns and expectations.

The main benefit considered is to protect the climate and environment, with a positive answer by 93% of the interviewers. On the other hand, the benefit of appropriate funding from the state was the less chosen, however it was ranked with 56%.

The main obstacle to replacing current heating systems with systems that use RES is the cost of replacement which end-consumers find it too expensive (71%). Despite of this, the same percent claim that they are satisfied with their current heating system. Other barrier that end-consumers emphasize is that it is not technically feasible that they replace their current system. This obstacle was brought up by 60% of the interviewees, whereas 56% interviewees pointed out that the replacement would require too much effort and it would disrupt their daily life.

Consumers show more interest in solar thermal energy (85%) for replace their heating systems, while the second energy source most interested in the interviewers was biomass, with 63%.

They claim to be aware of the environmental problems that their current boilers may cause by the use of non-renewable energy, because there are 73% of interviewers that indicate they are not 100%

satisfied with their current heating system due to environmental reasons. The second reason for respondents' dissatisfaction is the high price of fuel, it was brought up by 60% of the interviewers. Also, one of the main reasons which was chosen by 50% of end-consumers is the high energy consumption of their current system

Replacement of the current heating system is planned by more than half of interviewers. However, only 40% plan to replace the current system with a new RES system, whereas 47% is not thinking to replace it.

- Regarding attitudes, channels and preferences

Consumers emphasize the durability and reliability of their current system as well as the possibility to regulate their heating system. On the other hand, they claim to pay more compared to other similar consumers, having a high price in their bill. They would change their system if there is a reasonable or big improvement in the RES system compared to their current boiler.

When having problems with their system - 28% of end consumers indicate to have technical failures with their current system - half of survey respondents would inform to a technical service. Whereas, 33% would notify to their home insurance. Other possibility that consumers indicate, was to call a trusted technician (17%).

Criteria that would most influence or already influence consumers when making a decision to change the heating system is that the replacement is carried out by a trusted installer or by that engineer who shows seriousness and safety in the work that will be carried out. Also, respondents are very aware of the consumption of the system, being the second most appropriate opinion to carry out the change of technology. Other consumer criteria to select a certain technology are: environmental reasons, technology guarantees, ease to use or government grants.

67% of consumers believe that switching to a new more efficient heating system would increase the value of their house or apartment, and 20% of them think that this has no impact on the value of their property.

The sources of information that consumers use when thinking about changing the heating system/energy source or making decisions about replacing the system/energy source are majority cases the information that can be obtained online.

### **1.13.2.2 General benefits, barriers, concerns and expectations**

#### **Main benefits of replacing an old heating system with a renewable system**

In this part of the interview, end-consumers could choose between multiple answers on the benefits which would incentivize them to replace their old heating. The answer with more positive reactions was to *protect the climate and environment*, with a 93% of the interviewers.

On the other hand, the benefit of *appropriate funding from the state* was the less chosen, however it was ranked with 56%. The rest of the benefits included in the survey (*being independent of rising energy prices, environmental friendly alternative to petrol and gas,...*) have obtained a similar relevance to 80%.

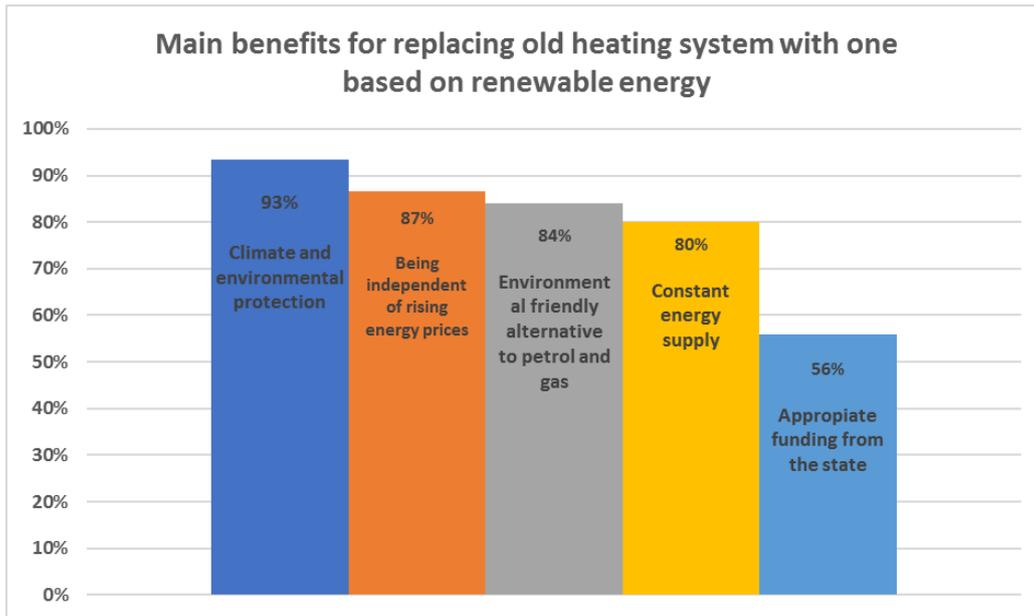


Figure 74: Main benefits for replacing old heating system with one based on renewable energy

### Main barriers for replacing old heating system with one based on renewable energy

The method to answer this question about the main barriers for replacing old heating system follows the same guidelines as the previous one about their benefits.

The main obstacle to replacing current heating systems with systems that use RES is the cost of replacement which end-consumers find it too expensive (71%). Despite of this, the same percent claim that they are satisfied with their current heating system.

Other barrier that end-consumers emphasize is that it is not technically feasible that they replace their current system. This obstacle was brought up by 60% of the interviewees, whereas 56% interviewees pointed out that the replacement would require too much effort and it would disrupt their daily life.

In addition, almost the half of the interviewers (49%) is doubtful about the environmental benefits of new heating system.

The following image shows the percent for each main barrier.

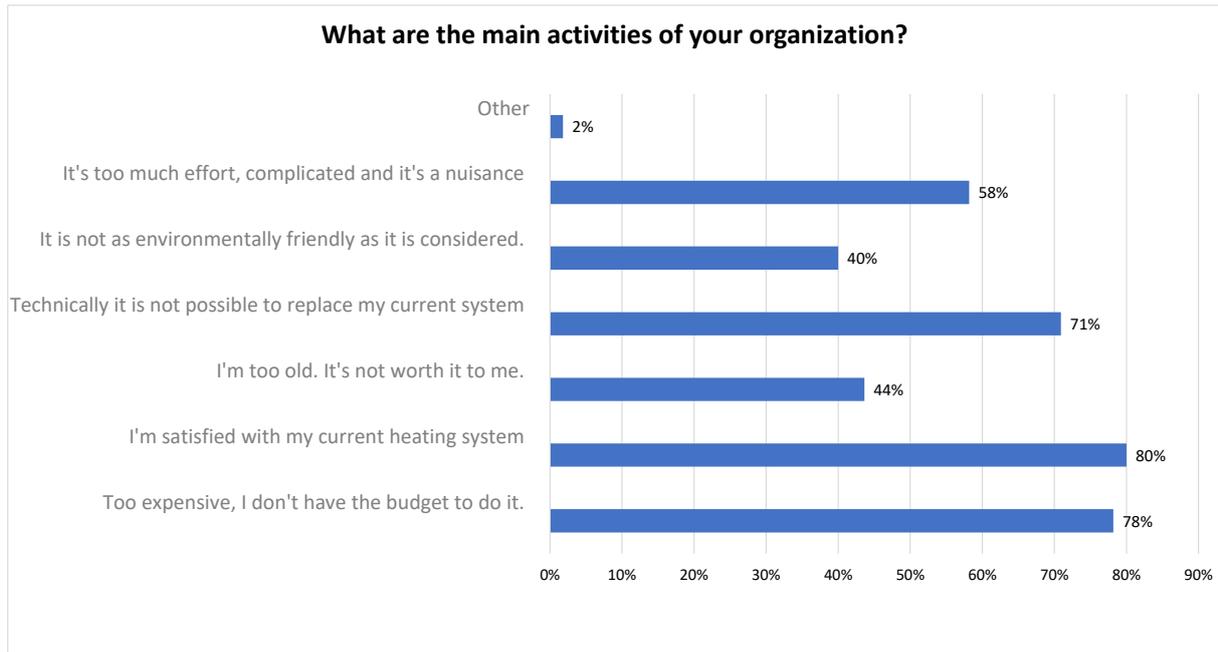


Figure 75: Main barriers for replacing old heating system with one based on renewable energy

### Form of renewable energy that consumers can imagine choosing for heating purposes

According to the results of the research, end consumers show more interest in solar systems for replace their heating systems. However, the second energy source most interested in the interviewers was biomass, only with 22% difference with solar system. Whereas, less of half of end consumers are not familiar with the heat pumps and their operation system, as just with pellet boilers.

Figure 7 expose the distribution of renewable energy that consumers imagine for their new heating systems.

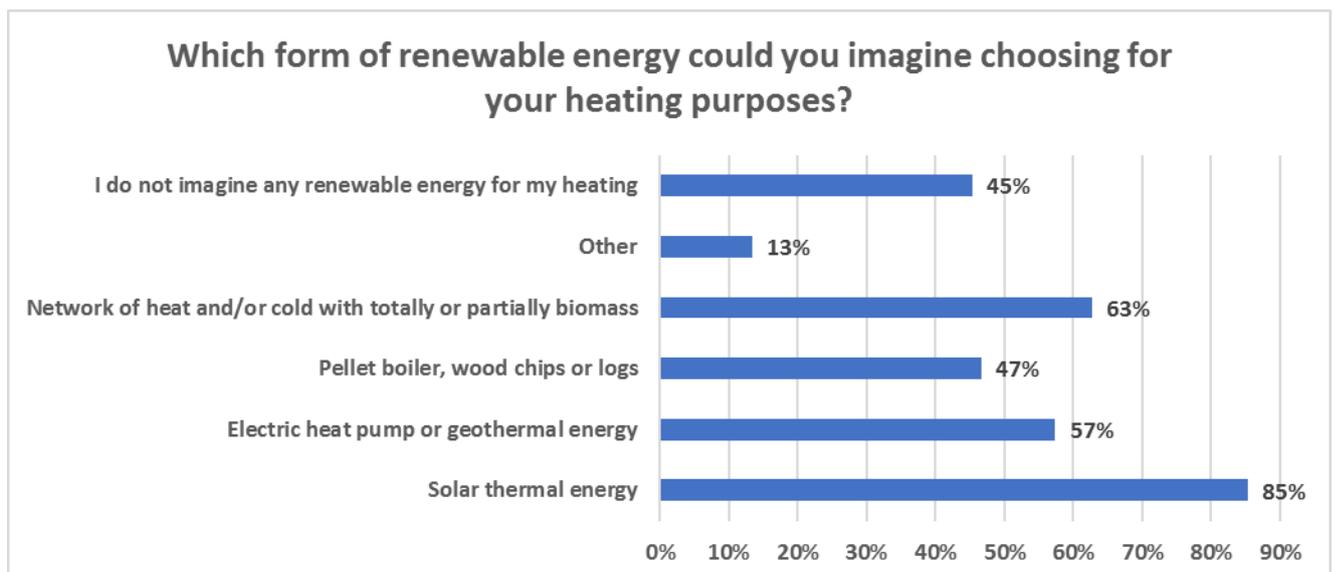


Figure 76: Renewable energy that consumers image for their new heating systems

### Reasons for dissatisfaction with current heating system

End consumers claim to be aware of the environmental problems that their current boilers may cause by the use of non-renewable energy, because there are 73% of interviewees that indicate they are not 100% satisfied with their current heating system due to environmental reasons.

The second biggest reason for respondents' dissatisfaction is the high price of fuel, it was brought up by 60% of the interviewees. Also, one of the main reasons which was chosen by 50% of end-consumers is the high energy consumption of their current system.

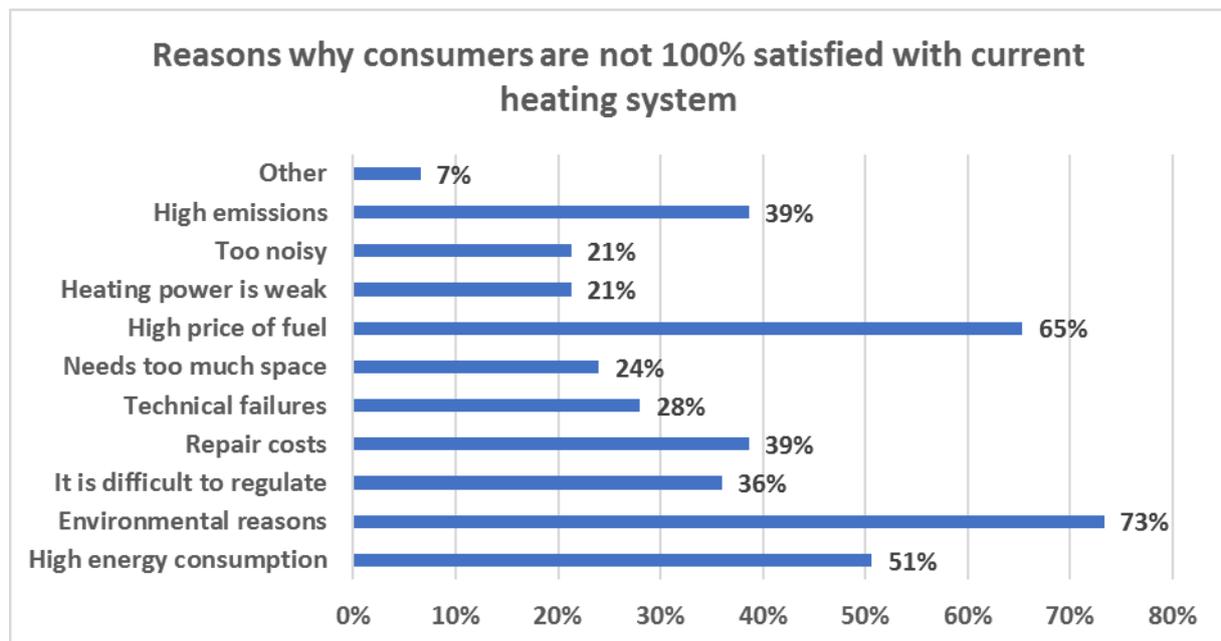


Figure 77: Reasons why consumers are not 100% satisfied with current heating system

Additional negative aspect mentioned was high emissions with 37% of answers, as we can see at figure 8. It shows that the most relevant dissatisfactions who have consumers with their current systems are very related to the environmental reasons or problems they may cause.

### Consideration of heating system replacement; changing to a new energy source/fuel

Replacement of the current heating system is planned by more than half of interviewees. However, only 40% plan to replace the current system with a new RES system, whereas 47% is not thinking to replace it.

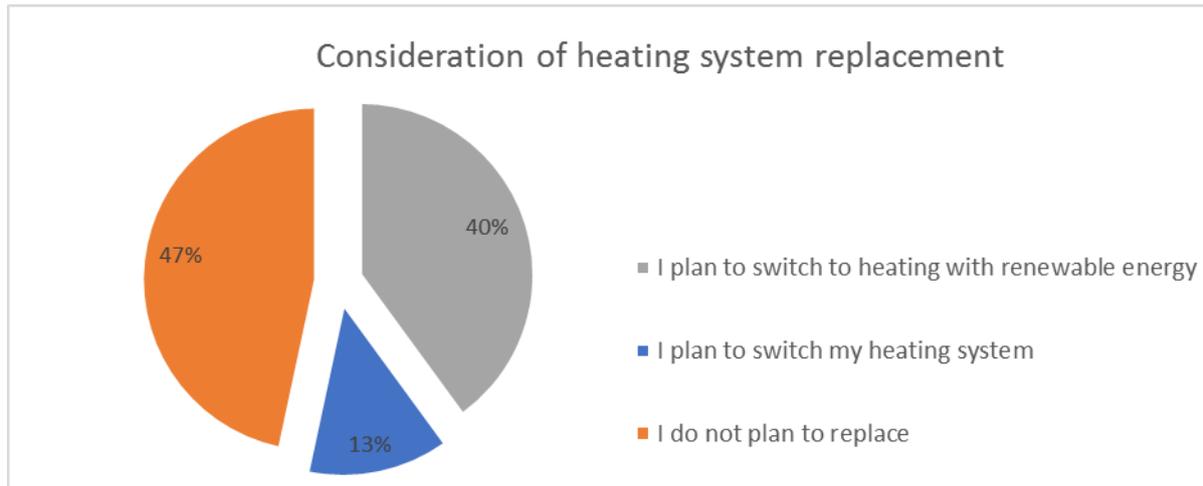


Figure 78: Consideration of heating system replacement

### 1.13.2.3 Attitudes, channels and preferences

#### Negative and positive aspects of heating for the consumers

It is important to note that most interviewees have a unified opinion about negative and positive aspects of their boiler. They emphasize the durability and reliability of their current system as the most important qualities. In turn, another of the positive aspects that indicate the possibility of thermoregulation of the system and automated operation of the heating system.

On the other hand, end consumers claim to pay more compared to their acquaintances, so the most relevant negative aspect has been the high price of the heat system bill.

In addition to indicating the negative and positive aspects of their current technology, it has been studied percentage of consumers would change the technology of their current system.

The results obtained are that there is the same percentage of population that would really like to change technology to the one that would in no way change its current source energy (13%).

On the contrary, 40% of respondents say they would change technology if there were a small improvement. While the remaining 33%, for them to change technology they need that there is a significant improvement.

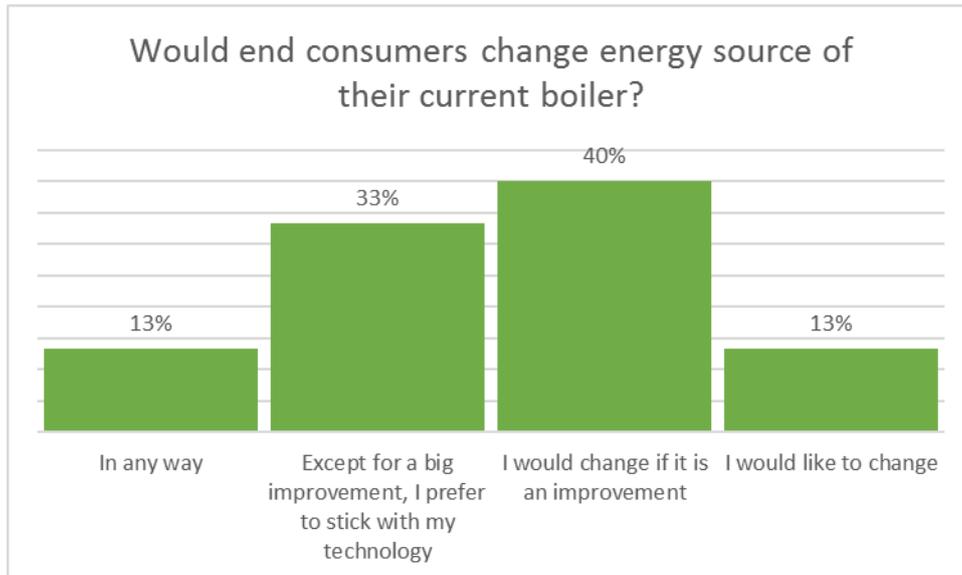


Figure 79: Wish to change energy source of current boiler

#### Any negative or positive experience with installers, maintainers, others

According to the research, only 28% of end consumers indicate to have technical failures with their current system. At this case, half of survey respondents would inform to a technical service. Whereas, 33% would notify to their home insurance. Other possibility that consumers indicate, was to call a trusted technician (17%).

Nevertheless, option of going to a repair shop or buy another directly, was not a possible answer for end consumers.

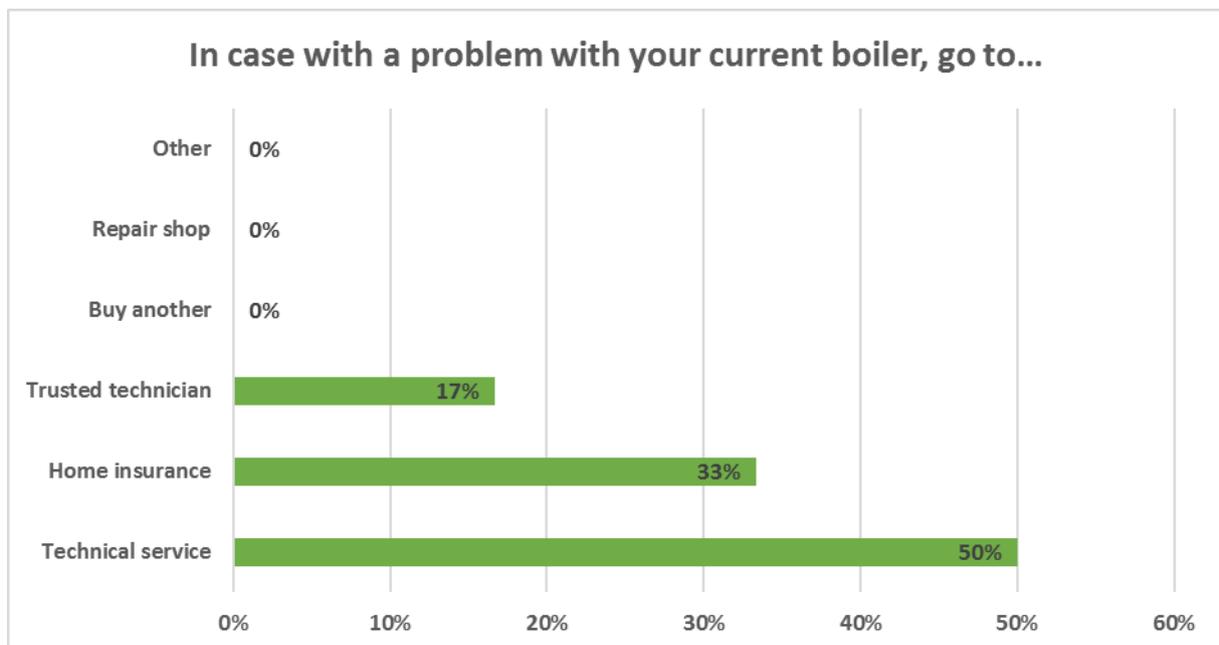


Figure 80: Possibilities in case end consumers would have a problem with their current boiler

Despite of these possibilities is case end consumers would have a problem with their current boiler, they affirm to have had no negative experience with any of the above-mentioned services.

### Consumer criteria to select a certain technology

Criteria that would most influence or already influence consumers when making a decision to change the heating system is that the replacement is carried out by a trusted installer or by that engineer who shows seriousness and safety in the work that will be carried out. Also, respondents are very aware of the consumption of the system, being the second most appropriate opinion to carry out the change of technology.

One of the most common argument in favour of switching the technology is in relation to the work that can be carried out. End consumers have given such a prominent place to time aspect, as just economic aspect. In conclusion, respondents indicate that the overall cost is lower is one of the criteria to follow. On the contrary, they do not attach much importance to the fact that the financing proposal would be pay by instalments.

Other consumer criteria to select a certain technology are: environmental reasons, technology guarantees, ease to use, government grants...

### The consumer perception on whether climate friendly systems increase their home value

67% of consumers believe that switching to a new more efficient heating system would increase the value of their house or apartment, and 20% of them think that this has no impact on the value of their property.

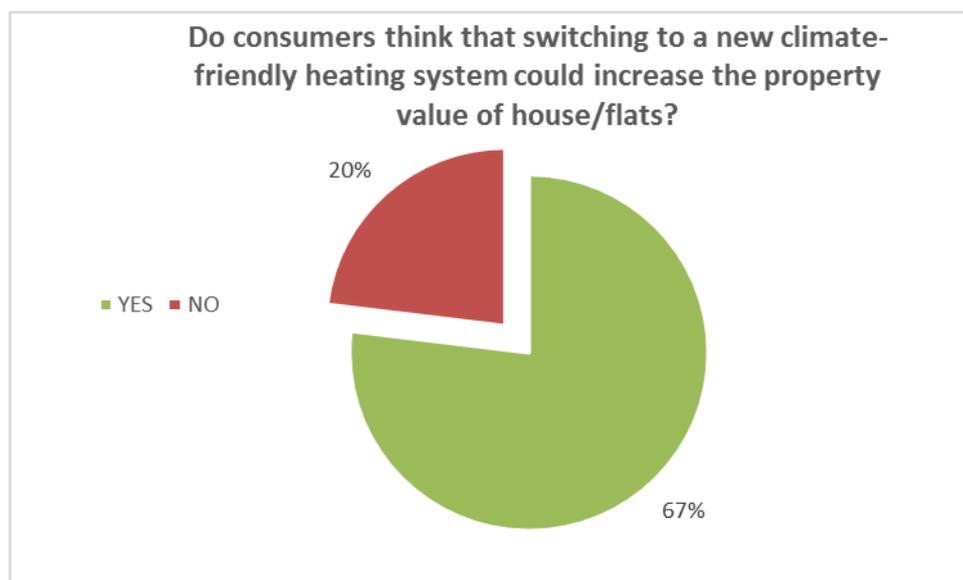


Figure 81: Consumers' opinion whether switching to a new climate-friendly heating system could increase the property value of their house/flats

### Information sources and channels which consumers uses

Majority of the interviewed consumers do not think about their heating systems often or regularly. In fact, end consumers used to think about in only in winter season (when the heating bills arrive).

The sources of data that consumers use when thinking about changing the heating system/energy source or making decisions about replacing the system/energy source are majority cases the information that can be obtained online.

Also, one of the most common sources is often as simple as conversations with neighbours or friends. A percentage of the population indicates that they have found information through advertisements on television, radio, bus shelters. Although most claim to obtain information through self-taught search.

### 1.13.3 Mindsets and interests of intermediaries

#### 1.13.3.1 Overview

##### Intermediaries group description

The analysis of mindsets of intermediaries included installers, maintainers, suppliers and similar organizations. There is a variety of companies within this group from small ones of a few people to larger organizations which develop projects for neighbourhoods or large buildings as they can be district heating.



Figure 82: Main activities of intermediaries

Most of the organizations present a medium to large share of incomes which are related to heating and cooling installations, which in practice will mean they are interested in improving their revenues in this field, thus benefiting from the study outputs.

##### Intermediaries group conclusions

- Fields of interest and general perception of consumer mindset

Depending on these fields of work, they carry out different types of projects of. According to the survey, the most common project is related to biomass systems (83%), followed by solar systems (58%) and aérothermal systems (42%). Whereas cold and heat systems is 25% and geothermal system projects have been selected by 33% of respondents.

Intermediaries feel the main benefits for consumers when installing a RES system was to protect the climate and environment, with 92% of the interviewers. It should be noted that this answer is in line with the same question for end-consumers, whose was chosen by 93%. According to the installers' experiences, other of the main advantage for end consumers when installing a RES system is based on being an alternative to oil and gas.

The main obstacle to replacing current heating systems with systems that use RES is the cost of replacement which end-consumers find too expensive (87%) and might need much effort to replace.

The range of clients that intermediaries estimate will replace their heating systems in the short term is in the range of 1 to 25% (90% of answers included in this range), which means that it is reasonable to conclude that at least 1 of every 10 clients will change their old boiler in the short term.

The aspects considered by intermediaries that would facilitate to convince customers to change their traditional fossil fuel system by a RES system are many, with much importance most of them (>50% of answers), with specific emphasis in being easy to use, reduction of the energy consumption, access to better financing, lower investment costs or lower energy cost.

- Business, experiences, market and training

Many of the companies indicated that a great share of their incomes come from the heating and cooling sector, as over 50% of the companies indicated that more than 50% of their revenues are due to it.

There are many policy support measures stated by the intermediaries which would help to increase the RES for heat systems renovation. Marketing campaigns, mechanisms to pay for CO2 emissions and frequent inspections are considered of outmost importance by 80% of the intermediaries. Over 70% consider that also subsidies, public sector best practices, training to professionals or making financing easier would support it.

According to intermediaries, the main obstacle to replace current heating systems by RES is the cost of replacement which end-consumers find it too expensive (87%). They claim which is high compared to the low standard incomes of the population. Other barrier that intermediaries consider relevant is that it is too much of an effort for the consumer. This refers to the number of hours of installation, the need to be at home usually to be aware of the change, possible problems that may delay the work, etc.

### **1.13.3.2 Fields of interest and general perception of consumer mindset**

The intermediaries surveyed work in various fields, among which we can find heating installers (42%), cold equipment installers (17%), equipment repairer (33%), equipment manufacturer (33%), energy consultants (33%).

Depending on these fields of work, they carry out different types of projects of. According to the survey, the most common project is related to biomass systems (83%), followed by solar systems (58%) and aerothermal systems (42%). Whereas cold and heat systems is 25% and geothermal system projects have been selected by 33% of respondents.

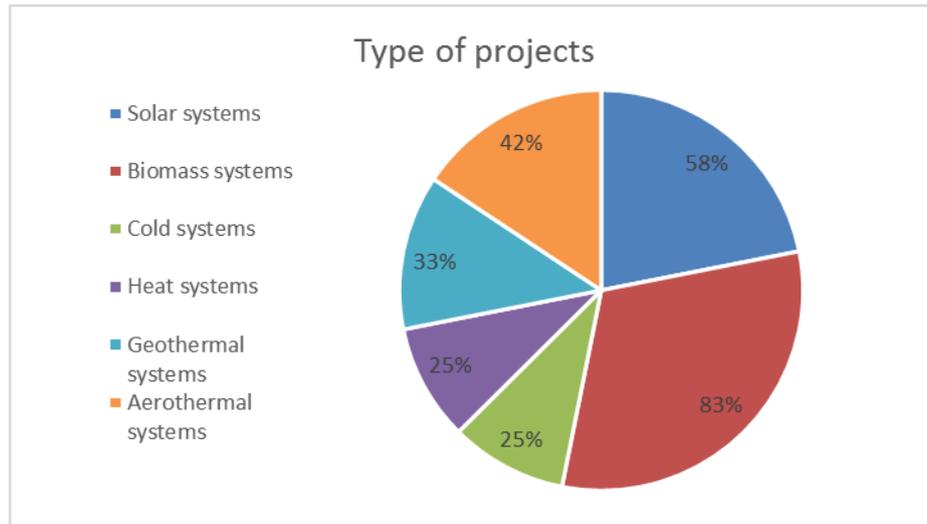


Figure 83: Renewable heating (RES-H) technologies interviewed intermediaries are working with

### What are for them the main benefits for consumers when installing a RES system?

In this part of the interview, intermediaries could choose between multiple answers on the benefits for consumers which would incentivize them to replace their old heating. The answer with more positive reactions was to *protect the climate and environment*, with 92% of the interviewers. It should be noted that this answer is in line with the same question for end-consumers, whose was chosen by 93%.

According to the installers' experiences, other of the main advantage for end consumers when installing a RES system is based on being an alternative to oil and gas. We can therefore see that installers recognise that end consumers have environmental reasons.

They also emphasize the permanent and constant supply of energy, selected by 75%. On the contrary, the benefit with a lower percentage, although still high (67%), is the obtaining of public subsidies.

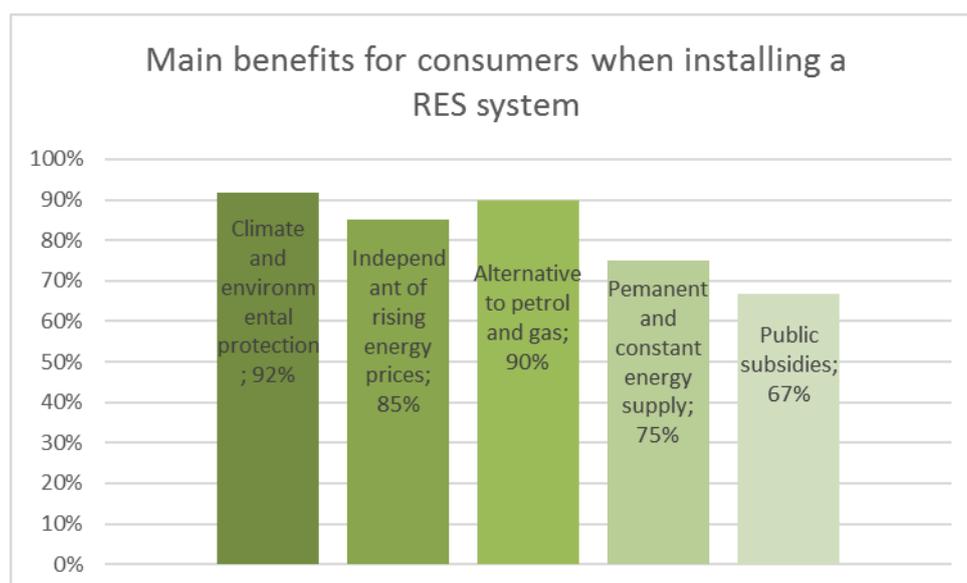


Figure 84: Main benefits for consumers when installing a RES system, according to installers

### What are the reasons why consumers are not satisfied with their current heating system?

According to the intermediaries, the reasons for dissatisfaction depend on the system and the type of fuel they use. What is mostly stated is that end consumers consider they are expensive and might need much effort to replace. Often consumers look satisfied with their current system and sometimes it is not technically possible to change to a RES system.

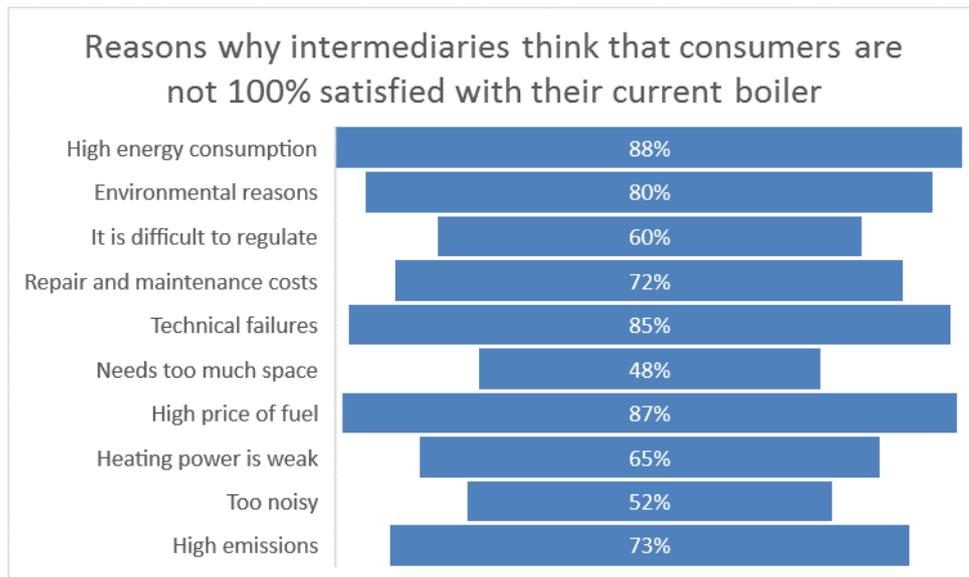


Figure 85: Reasons why intermediaries think that consumers are not 100% satisfied with their current boiler

### How many of your clients do you estimate will replace their old heating system within one year?

The range of clients that intermediaries estimate will replace their heating systems in the short term is in the range of 1 to 25% (90% of answers included in this range), which means that it is reasonable to conclude that at least 1 of every 10 clients will change their old boiler in the short term.

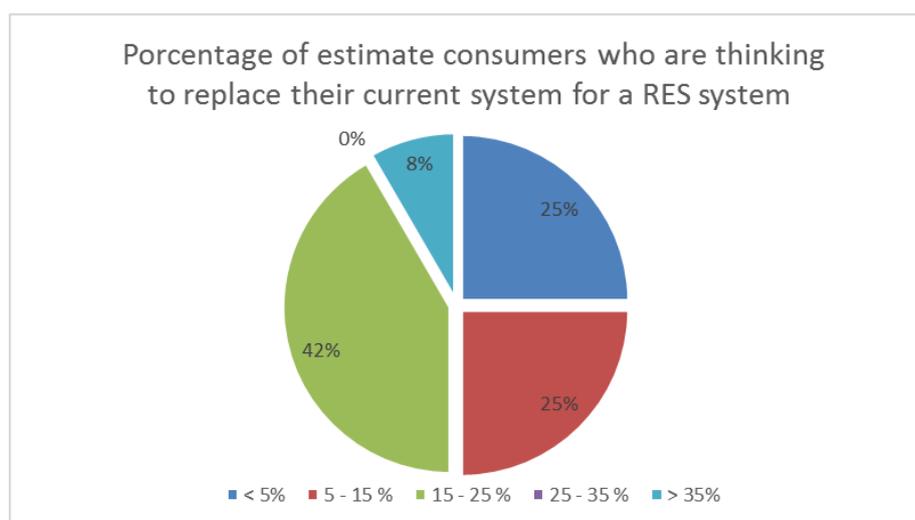


Figure 86: Percentage of estimate consumers who are thinking to replace their current system for a RES system

### What would consumers need to make it easier to convince them to switch energy carriers?

The aspects considered by intermediaries that would facilitate to convince customers to change their traditional fossil fuel system by a RES system are many, with much importance most of them (>50% of answers), with specific emphasis in being easy to use, reduction of the energy consumption, access to better financing, lower investment costs or lower energy cost. Also guarantees and public subsidies are seen as favourable.

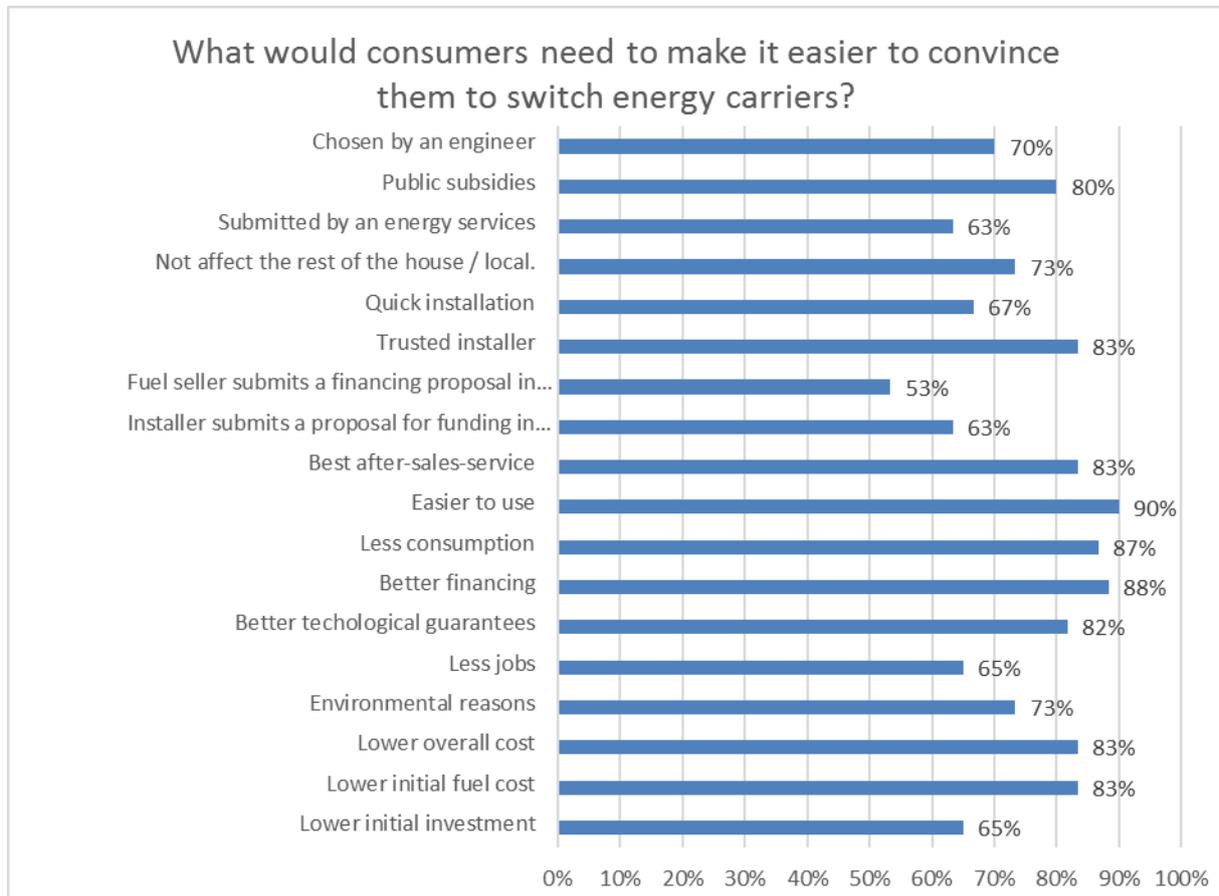


Figure 87: What would consumers need to make it easier to convince them to switch energy carriers?

### 1.13.3.3 Business, experiences, market and training

#### Relevance of heating and cooling in their business model

The following image represents their share of incomes related to heating and cooling as this is the scope of this survey. Many of the companies indicated that a great share of their incomes come from the heating and cooling sector, as over 50% of the companies indicated that more than 50% of their revenues are due to it.

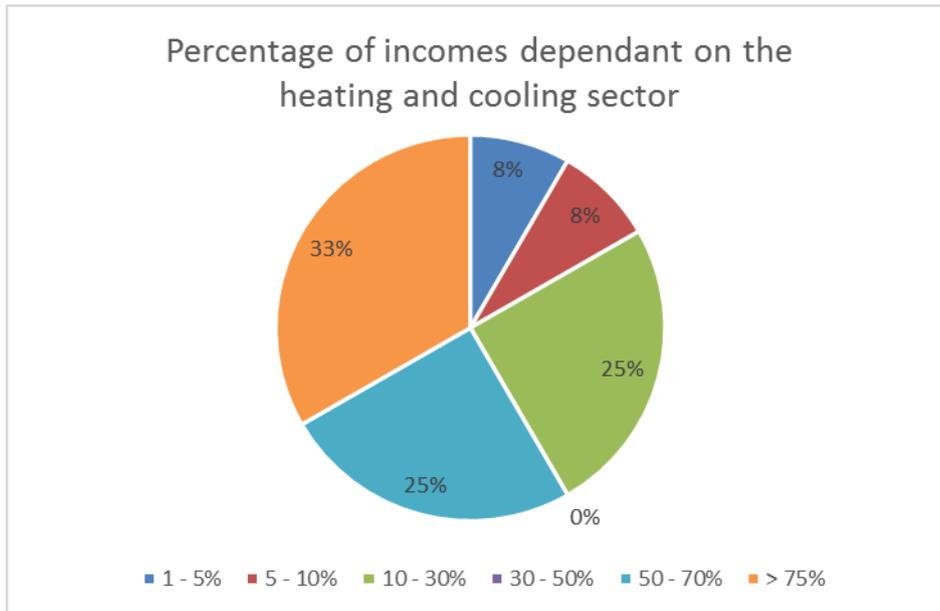


Figure 88: Percentage of incomes dependant on the heat and cooling sector

### How many transactions per year does your company reach in space heating and cooling?

Companies have in general a large number of business done along the year in heating and cooling, most of them (67%) mention over 20 projects developed every year. 92% mention they do over 5 transactions.

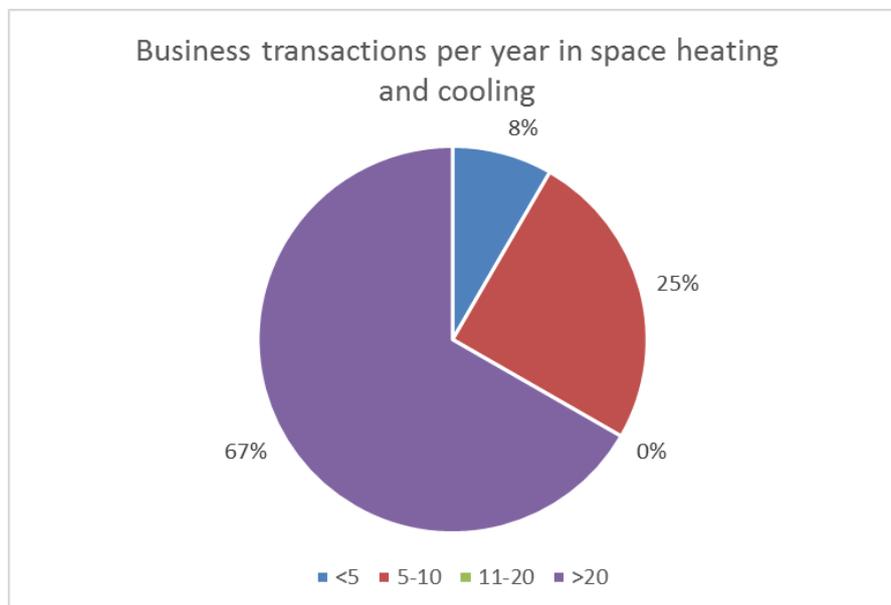


Figure 89: Number of average transactions (business) per year

### Which are the best policies to support RES for Heat?

There are many policy support measures stated by the intermediaries which would help to increase the RES for heat systems renovation. Marketing campaigns, mechanisms to pay for CO2 emissions and frequent inspections are considered of outmost importance by 80% of the intermediaries. Over 70% consider that also subsidies, public sector best practices, training to professionals or making financing easier would support it.

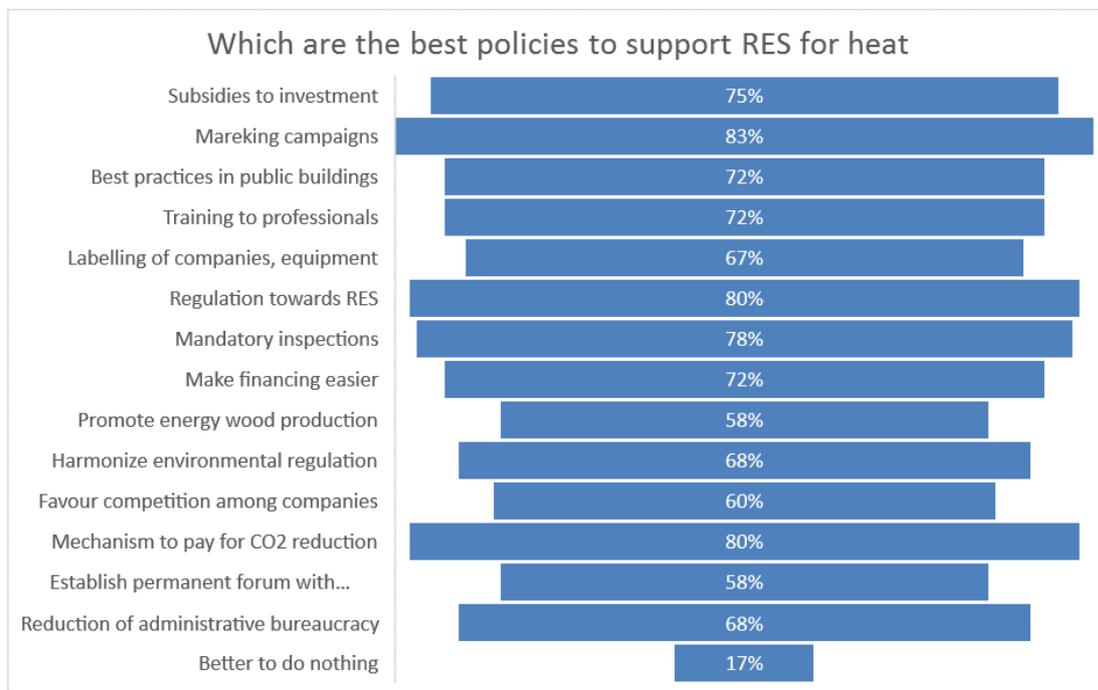


Figure 90: Best policies to support RES for heat

### What are the main barriers for consumers when installing a RES system?

The method to answer this question about the main barriers for replacing old heating system follows the same guidelines as the previous one about their benefits.

The main obstacle to replacing current heating systems with systems that use RES is the cost of replacement which end-consumers find it too expensive (87%). Because they claim which is high compared to the low standard of the population. Like the previous question, it corresponds to a similar percentage of consumers who chose that answer.

Other barrier that intermediaries consider relevant is that it is too much of an effort for the consumer. This refers to the number of hours of installation, the need to be at home usually to be aware of the change, possible problems that may delay the work, etc.

The rest of answers have a similar percentage: consumers are satisfied with their current system, they think they are too old to replace it and end consumers do not consider it as environmentally friendly as always think.

The following graphic shows the percent for each main barrier.

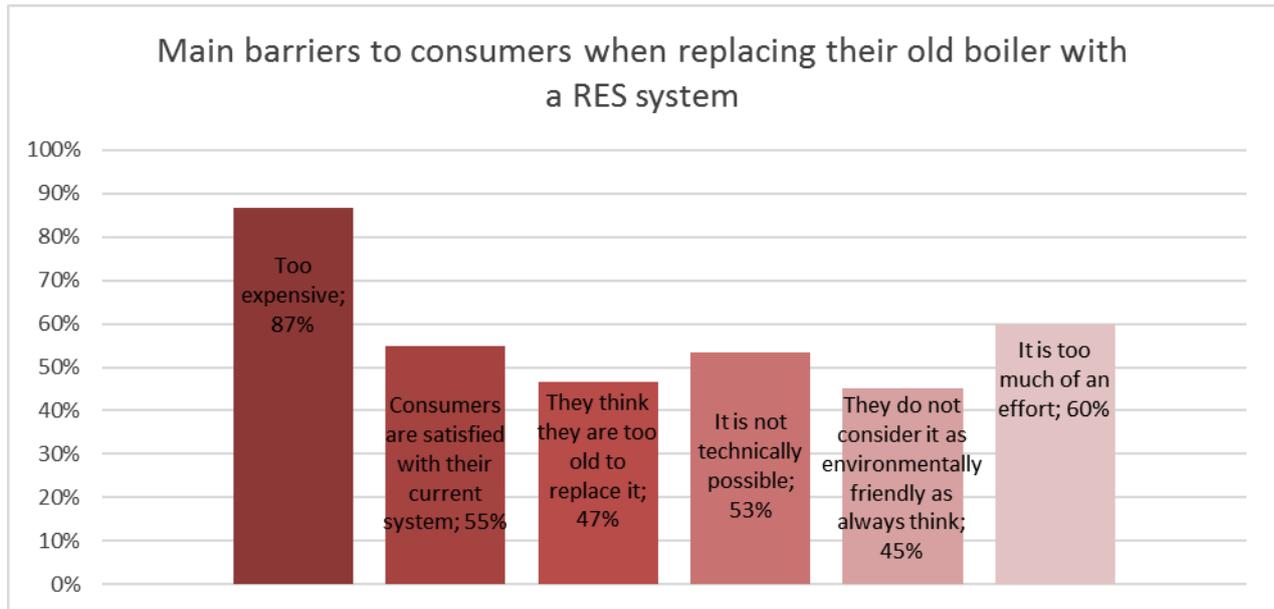


Figure 91: Main barriers for consumers when installing a RES system, according to installers

## 1.13.4 Mindsets and interests of large investors and project promoters

### 1.13.4.1 Overview

#### Investors group description

The analysis of mindsets of investors included energy services companies, business investors, project promoters and similar organizations. Typical companies from this group develop medium to large or very large projects, from few hundred thousand euros to several million, while usually they prefer the range 300,000 € to 10,000,000 €.

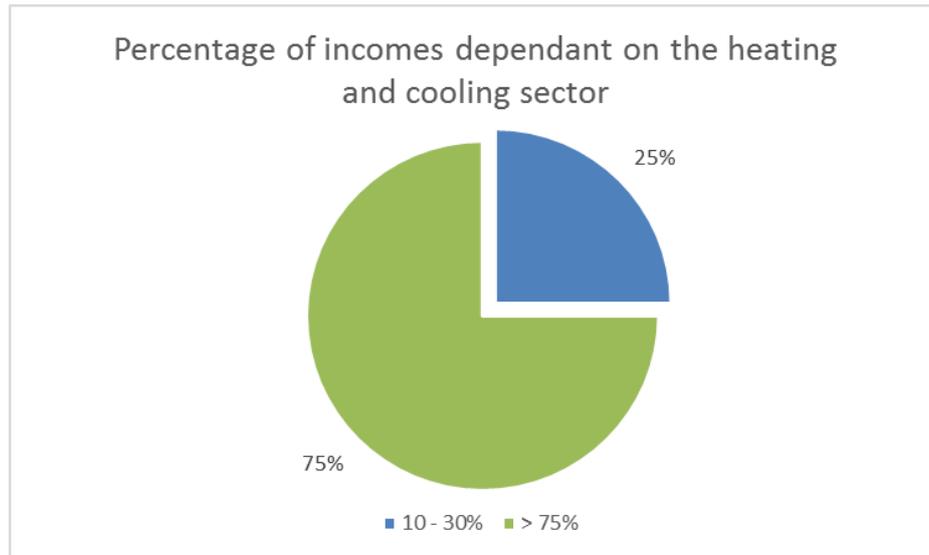


Figure 92: Percentage of invoicing dependent on the heat and cooling sector

Regarding the companies' origin, they are ESCOs (all provide services by this means), and 50% are project promoters as well. Some of them are just project investors or under the "others" group.

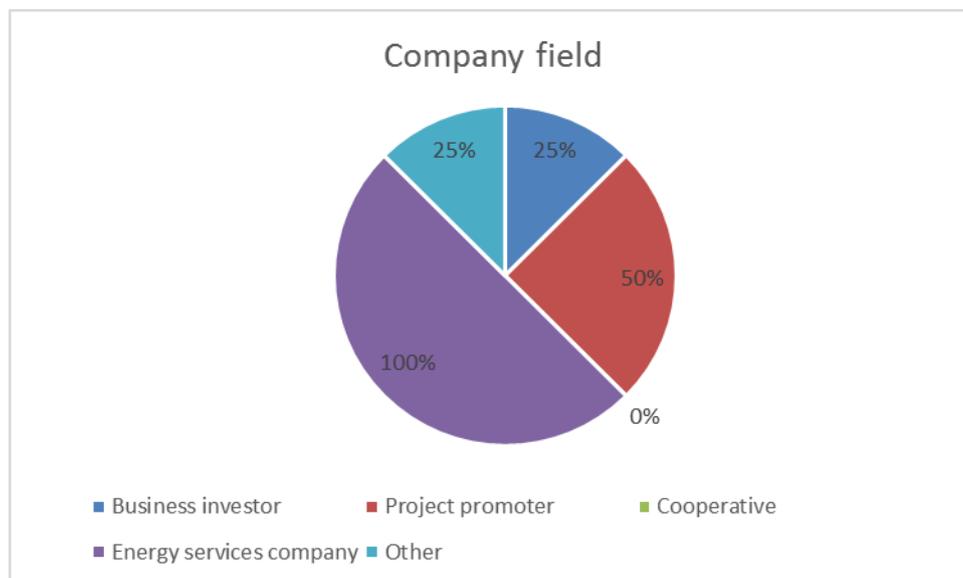


Figure 93: Company field

### Investors group conclusions

- Fields of interest and general perception of consumer mindset

Biomass heating systems is by large the technology used by most (all) the investors in heating and cooling as 100% indicated they use it. 50% use solar thermal energy, while other technologies as geothermal and other heating systems are used by some of them.

Investors claim that climate and environmental protection, alternative use of energy, energy independency and security of supply are key benefits for consumers of RES systems for heating and cooling. Public subsidies are considered relevant by 50% of them.

Consumers feel the barriers to use RES heating and cooling are due to these technologies are expensive (60% investors think in this way) and they are satisfied in great extent with their current system (60%). Furthermore, 40% mention that people think they might be too old to change their systems, it is not technically possible or it will constitute much effort for them.

- Business, experiences, market and training

The risks associated to investments considered by investors are mainly (above 40% investors mention them) increases in the fuel (biomass) or electricity price regarding the RES system demand, reduced energy price for customers, reduction in the use of energy by customers, lack of regulatory stability and investment costs higher than expected.

Related to the weakness of investment projects, a bad definition of the consumption demand is seen as the main one (over 50% investors). Others as not clear roles of all companies involved, not enough information regarding cost increases, financing schemes, socio-economic impact assessment or low commercial work are important weakness. Technical definition, legal issues and prices for energy supplied are the lowest weakness.

### 1.13.4.2 Fields of interest and general perception of consumer mindset

#### Field of RES-H they are focused and/or interested

Biomass heating systems is by large the technology used by most (all) the investors in heating and cooling as 100% indicated they use it. 50% use solar thermal energy, while other technologies as geothermal and other heating systems are used by some of them.

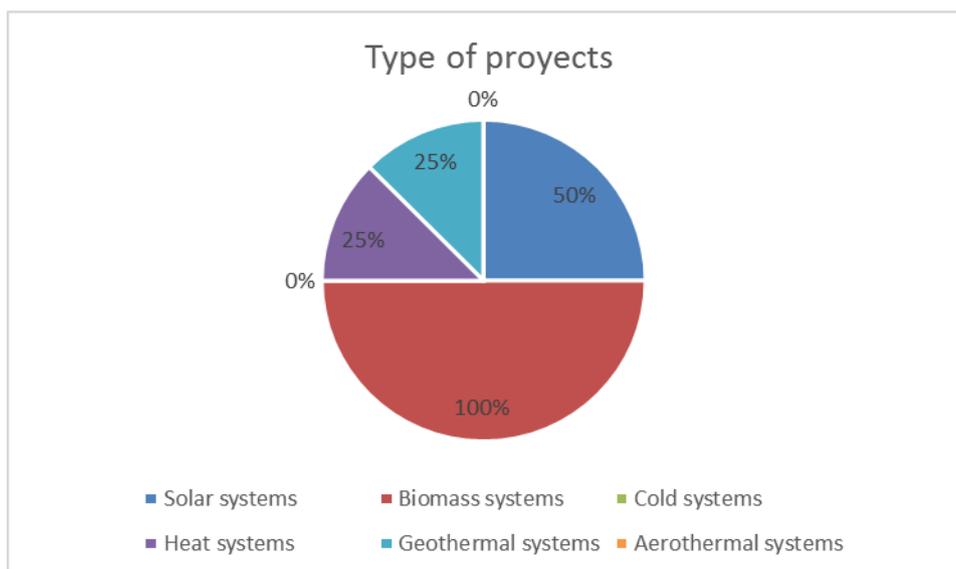


Figure 94: Renewable heating (RES-H) technologies interviewed investors are working with

#### What are for them the main benefits for consumers when installing a RES system?

Investors claim that climate and environmental protection, alternative use of energy, energy independency and security of supply are key benefits for consumers of RES systems for heating and cooling. Public subsidies are considered relevant by 50% of them.

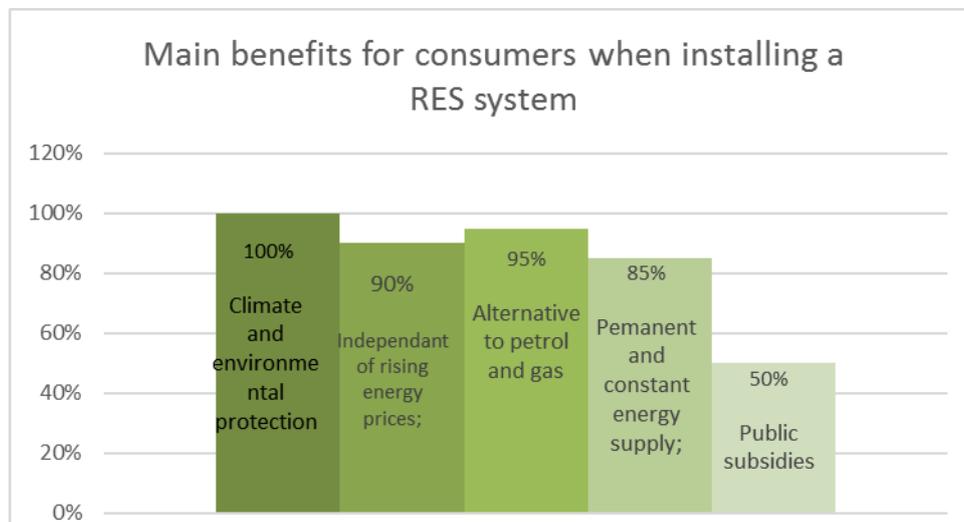


Figure 95: Main benefits for consumers when installing a RES system, according to investors

### What are for them the main barriers for consumers when installing a RES system?

According to investors conclusions, they think consumers feel the barriers to use RES heating and cooling are due to these technologies are expensive (60% investors think in this way) and they are satisfied in great extent with their current system (60%). Furthermore, 40% mention that people think they might be too old to change their systems, it is not technically possible or it will constitute much effort for them. Only 30% indicate that consumers don't have the clear picture of RES being environmental friendly.

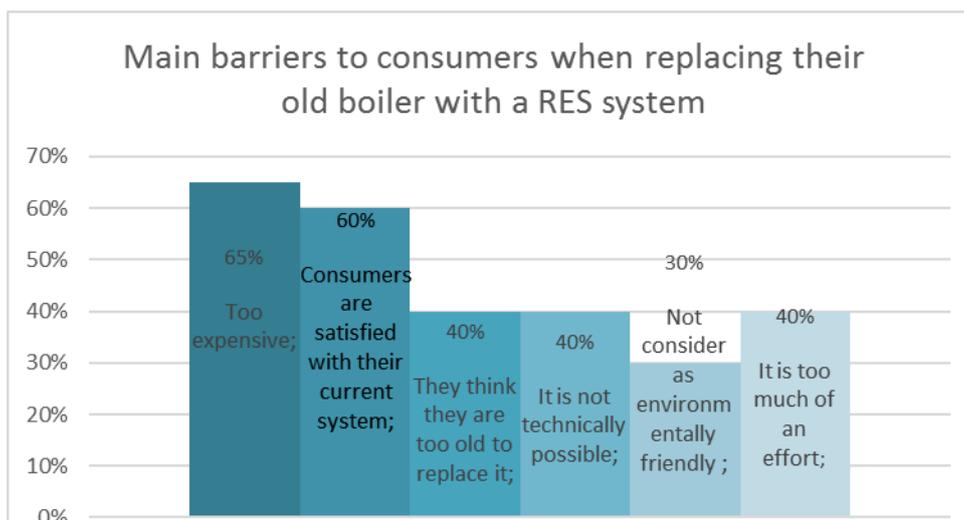


Figure 96: Main barriers for consumers when installing a RES system, according to investors

### Which percentage of consumers they perceive that will change soon (within 1 year from now) their heating system and by which new fuel/system?

Similar to intermediaries, the range of 5 to 15% is the one with higher percentage of success, thus 10% could be considered a reasonable figure of consumers thinking to replace their current heating and cooling system by RES.

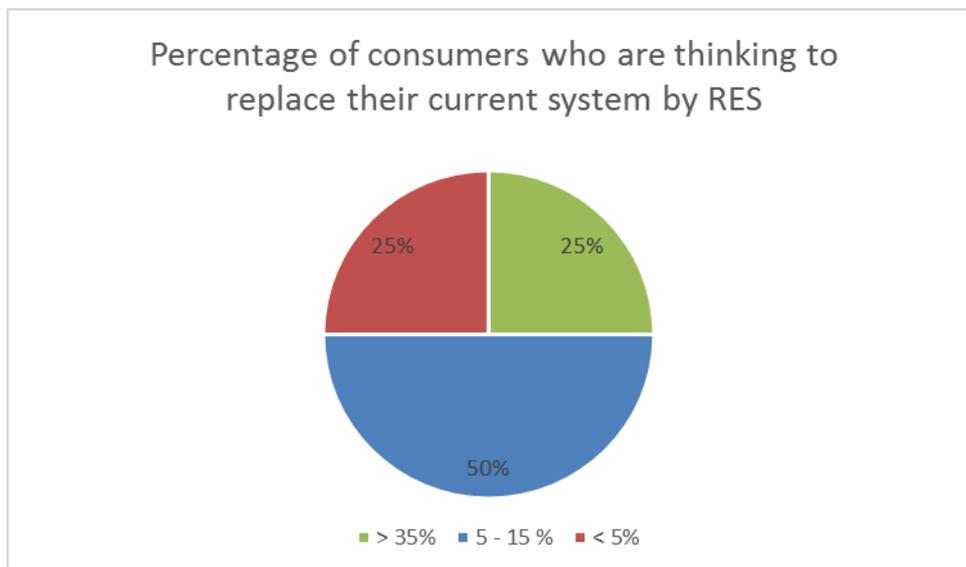


Figure 97: Percentage of estimate consumers who are thinking to replace their current system for a RES system

### 1.13.4.3 Business, experiences, market and training

#### Negative and positive aspects of providing consumer with RES heat instead of traditional fossil fuels

The risks associated to investments considered by investors are mainly (above 40% investors mention them) increases in the fuel (biomass) or electricity price regarding the RES system demand, reduced energy price for customers, reduction in the use of energy by customers, lack of regulatory stability and investment costs higher than expected. Technical failures or OM costs are the lower risks.

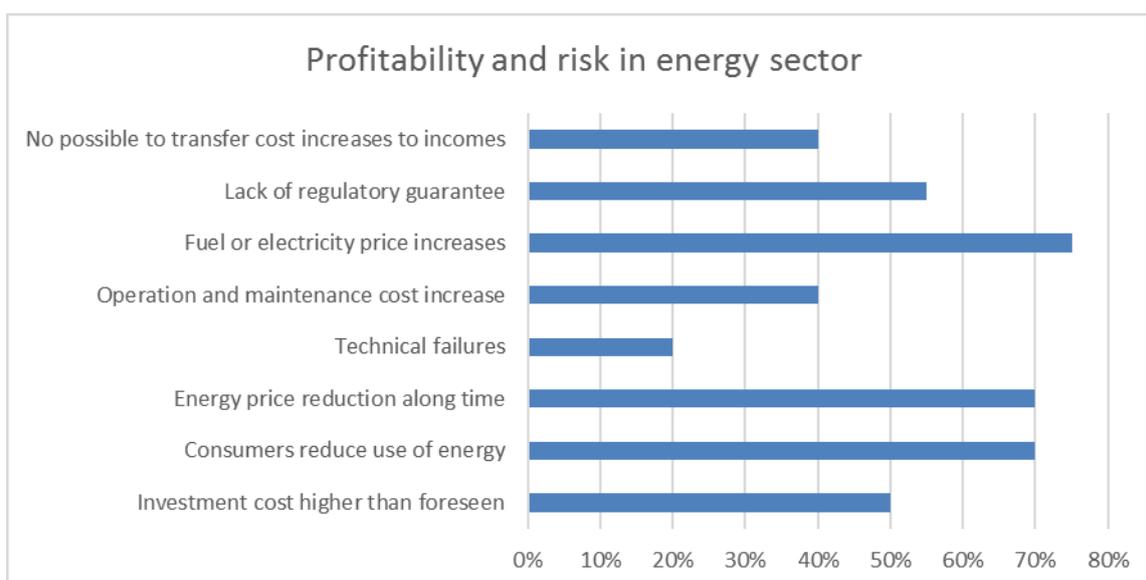


Figure 98: Profitability and risk in energy sector, according to investors

### Which are the main weakness faced in investment projects?

Related to the weakness of investment projects, a bad definition of the consumption demand is seen as the main one (over 50% investors). Others as not clear roles of all companies involved, not enough information regarding cost increases, financing schemes, socio-economic impact assessment or low commercial work are important weakness. Technical definition, legal issues and prices for energy supplied are the lowest weakness.

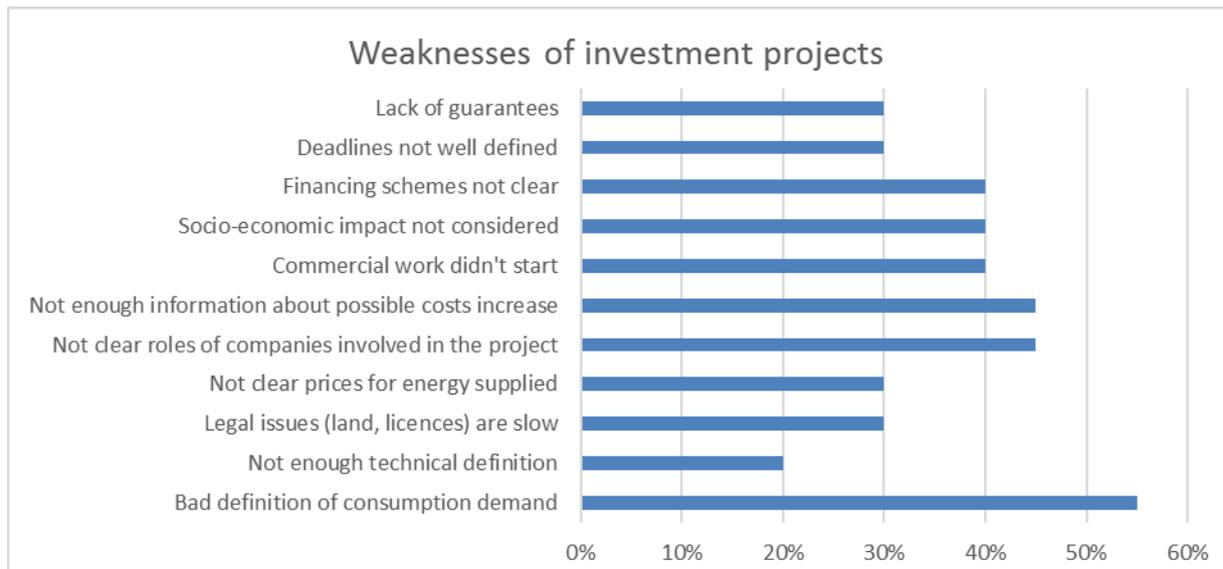


Figure 99: Weaknesses of investment projects, according to investors

## References (D-Heading)

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N/A

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