Report on tackling gender, energy poverty, rebound and lock-in aspects

Report D5.2

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Preface/Abstract

Half of Europe's energy consumption is used for heating or cooling. However, in 2019 58% of the 105.7 million space heaters installed in EU-27 – that were > 61 million units – have been inefficient non-condensing oil and gas boilers.

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 was 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.

To reach that goal, REPLACE project brought together installers, chimney sweeps, politicians, and other key players at one table, regionally.

The core activity of REPLACE was to develop, embed (by facilitating policy programs/measures) and implement nine (R)HC equipment replacement campaigns adjusted for local conditions and structures by a strong involvement of the so-called local working groups (LWG) in their design and implementation.

This report summarises the experience gained in developing, implementing and steering appropriate boiler/oven replacement campaigns and activities tailored to the situation of nine different pilot regions in eight countries participating in the REPLACE project. The campaigns and activities were developed together with relevant regional/local public and market actors, forming LWGs that steered and facilitated the actions taken to phase out a range of energy sources, such as oil, natural gas, coal, direct electricity and inefficient use of firewood from the residential heating market.

Discussing how to effectively address gender, energy poverty, rebound and lock-in issues was one of the tasks of this LWG. This report shows what has been done in this regard.

Executive Summary

REPLACE supports households to replace their old, inefficient heating equipment by modern, clean and climate-friendly heating systems being more comfortable and resilient. In the light of energy and climate crises, facilitating energy systems based on nearby available renewable sources energy – instead of fossil energy sources imported from non-democratic states – becomes of high relevance to free societies.

Given the different legal, regulatory and supporting (e.g. financial) framework conditions, market structures and circumstances, purchasing power and market development statuses, there is no one-fits-all solution to the challenge of phasing out oil, natural gas, coal, inefficient log wood and electricity only heating equipment from within European residential heat markets.

Replace shows, however that – due to efforts jointly undertaken with public and market stakeholders to establish an enabling environment (by adequate policy measures and programs) – there are many tailor-made activities and approaches existing that can facilitate this phase-out. This report shows what has been done to effectively address gender, energy poverty, rebound and lock-in issues.

In the Austrian pilot region, province of Salzburg, a one-stop shop for the replacement of old oil, gas or wood-fired boilers and direct electric heating systems has been developed and launched as a web platform, where households can find all-inclusive suppliers for the conversion. As the owners of inefficient, old heating systems are mostly elderly people and, due to their longer life expectancy, mostly women, the action is mainly targeted at women. An obligatory element of the All-Round Carefree Package (ARCP) is independent public energy advice. This is also particularly important as older people are often off-liners and on-site advice can be very helpful and further reduce barriers. The ARCP also includes mandatory measures to ensure high quality planning and implementation of the switchover. This is important for energy-poor households, which in Austria receive up to 100% of the investment needed for the switch (although the one-off subsidy is capped). Rebound effects are taken into account in the ARCP, as consumers are trained in the use of the new heating system when it is handed over, and the installer carries out optimisations one year after commissioning. Energy saving recommendations are given on both occasions. Tackling the lock-in effect is another mandatory element of the ARCP. ARCP suppliers are required to provide consumers with mobile heating units within 24 hours in the event of a breakdown of the existing heating system. This gives consumers a few weeks to make an informed decision to switch to a climate-friendly system and avoids the need for an emergency like-for-like (fossil fuel type) replacement.

Replacement campaign in Bosnia and Herzegovina addressed various challenges, including gender inequality, energy poverty, lock-in, and rebound effects. Despite having a legal framework for gender equality, women still face discrimination and limited representation in decision-making positions. To promote gender equality in the energy sector, the campaign aimed to ensure equal opportunities for women through training seminars and the Energy Summit. Energy poverty, affecting vulnerable groups, remains unrecognized in Bosnia and Herzegovina's legal framework. Hence, the campaign targeted vulnerable people in smaller urban and rural areas by providing educational activities and info hubs, along with pre-feasibility studies to enhance their heating systems' efficiency, leading to long-term benefits and cash savings. The energy sector in BiH is dominated by fossil fuels and inefficient practices, perpetuating these practices in a lock-in situation. The project team aimed to break this situation by promoting energy efficiency, renewable energy sources, and sustainable practices. Finally, the project team aimed to prevent the rebound effect by promoting energy-saving behaviors and raising awareness of the long-term benefits of sustainable practices, helping households maintain the benefits of energy efficiency measures and reduce energy costs.

In the Bulgarian Rhodope region, the majority of the households use stoves burning logwood and coal briquettes, which is associated to high physical effort, lost opportunities to spend time in alternative ways, and exposure to high indoor air pollution, so the promoted clean, efficient, and automated technologies provide significant benefits to women, who typically stay longer at home, take care of household chores, and represent the majority of the elderly population. Energy poverty was alleviated by promoting relevant financing schemes, focusing on cheaper solutions and using communication channels that reach the vulnerable consumers. The rebound effect was mitigated by promoting a range of energy efficiency and metering measures, as well as by raising people's awareness about the importance to save energy and emissions. Finally, the lock-in effect was addressed mainly by disseminating information about all long-term risks, associated with inefficient, polluting, and/or fossil-based heating.

The REPLACE project in the North-West region of Croatia aims to address energy poverty by promoting energy efficiency and sustainability through campaigns and information hubs that provide advice and information to households, especially those that are socially vulnerable. The project focuses on women's involvement in renewable energy projects and helps end-users with low incomes to lower their energy bills by installing efficient heating systems. The project aims to reduce rebound effects by promoting energy efficiency measures and educating building managers and citizens. It also aims to overcome lock-in effects by promoting alternative, climate-friendly options, engaging and educating stakeholders, and developing a national program for fighting energy poverty.

In Primorsko-goranska County (the second Croatian pilot region) EIHP discussed the rebound, lock-in effects, gender aspects and energy poverty issues at local working group meetings and during the implementation of the activities. When looking at gender aspects, some of the discussed measures included removing all stereotypes in communication and promoting gender equality, working on educating all parties to create equal opportunities, and ensuring equal compensation based on performance, rather than gender. Various measures were looked at to tackle the rising issue of energy poverty, some of which included lowering the room temperature, reducing the temperature during the night , installing thermostats and control systems, removing objects that cover the radiators etc. One of the main recommendations to the end-consumers for tackling rebound issues was for them to install the thermostats and thermostatic valves so that they can monitor their consumption and be able to lower it in case it is unnecessarily high. In order to reduce the lock-in effects, subsidizing would be of great help to the consumers who are motivated to invest in new systems, as well as the continuation of the promotion of RES in heating in order for them to be able to make an informed decision.

The framework conditions for heating exchange have developed positively for the REPLACE project in Germany. This also has a positive effect on aspects such as energy poverty, rebound and lock-in effects. In addition to the federal initiatives, Energiewende Oberland has put the issue of energy poverty, which affects women in particular, on the agenda of three expert advisory boards on district und municipal level in the region. Results will also be passed on at the joint meeting of the climate and energy advisory boards in April 2023. In addition, Energiewende Oberland has added a link to easy-to-implement energy-saving tips from the consumer advice centre, which tenants can implement as well, on the dedicated and comprehensively promoted website (offline and online) www.wärmewende-oberland.de. Following the advice from the energy and climate advisory boards to advertise the offers of the consumer advice centre (independent and free of charge) on the topic of energy saving in job centres, debt counselling centres, food banks, etc., Energiewende Oberland forwarded the corresponding posters of the consumer advice centre to the climate protection managers of the region. As units of district offices and municipalities, they have access to the local advice centres and can distribute the posters. In order to counter lock-in effects, Energiewende Oberland has compiled a list of seven providers from the region and the wider region and promoted the use of mobile heating containers. The list can be viewed on the dedicated website www.wärmewende-oberland.de.

Considering the latest economic developments, few of the campaigns and activities in the North Macedonian KAGoP region have addressed some horizontal aspects such as rebound, avoiding lock-in effects or gender and energy poverty aspects when replacing heating systems, mostly tackled as awareness raising activities. Therefore, many of the activities focused on gender issues, as they were actively carried out by women and nonetheless advised many others how to successfully run a transformation and replace their heating system, a process which tends to be more familiar to the male population. Regarding the energy poverty aspects, the government has recently repurposed additional finances and improved the subsidy schemes for these households. The latest updates from the legislation were also communicated through our campaign activities, such as the municipal information hubs and the annual boiler labeling campaign. The rebound effect and possibilities to avoid lock-in effects were communicated during the panel discussion and roundtables with the key stakeholders and shared with the participants as precaution measures that one could undertake to prevent sudden failure, thus to reduce the overall energy consumption by improving their own comfort.

During the project duration, JSI and LWG members in Slovenia put in careful thought and consideration of rebound and lock-in effects and gender and poverty issues when crafting the initiatives for campaigns. Every effort to address the heating sector should ensure gender and energy-related poverty are taken into account as part of their strategy. The stand-out point is the prepared policy program that integrated REPLACE content into the public call as well as *step by step process of the boiler replacement manual*, respectively include quality assurance items and procedures that make it a good basis for boiler replacements in energy poor households for the future. Those households in Slovenia receive up to 100% of the replacement investment refunded via a (capped) one-off subsidy.

In Spain there has been a focus on involving an equal number of female and male participants in the project activities, which was considered since the constitution of the Local Working Group. The Spanish REPLACE partners considered this factor to equal genders in activities like training workshops, technical visits, technical assessment and any other project action. The overall result has been successful in terms of reaching a relevant number of female stakeholders. The involvement of women is relevant for the gender aspects since the boiler and biomass industry have been historically managed by a predominantly male workforce. Reducing energy poverty was also a project focus, discussed frequently with the LWG, particularly successful by means of the grants programmes published by the Regional Government and promoted in REPLACE. Also, LWG members, as REPLACE project promoters and advisors, informed residential consumers on the need of knowing their energy consumption (as by their bills or metering systems) increase their awareness on their energy use and avoid rebound effect. Lock-in effects were also addressed with the LWG as there is frequent use of fossil fuels as coal or oil heating in the region, and members put effort in changing installers and advisors mindsets to renewable energy sources.

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1. Scope of the report

Gender and Energy Poverty

As could be seen in the stakeholder interviews conducted in the various REPLACE pilot regions, a number of households, which demonstrated unwillingness to switch their heating systems, shared several commonalities, including limited financial resources, lack of access to information (and to the internet) and increased age group. Senior citizens are most affected by improper or outdated heating systems, because they not only have restrictions on their ability to get financial loans, but also do not want to have to go through the additional trouble. Since women tend to have a longer life expectancy than men do, women are also disproportionately more affected by these issues.

Energy poverty can be understood as the inability of a household to experience essential energy services as a result of overall social disadvantages, below-average household income, high energy costs and inefficient buildings[1]. Energy poor households can be those households who are either unable to adequately heat their homes or those that suffer from above-average energy costs and the related financial burden[2]. Studies have shown that vulnerable consumers, who are affected by energy poverty, tend to be older, suffer from disability or illness, work part-time jobs, live alone and only have access to a single income (e.g. single parents)[3]. Due to existing societal gender inequalities, women tend to earn less over their lifetime than their male counterparts and thus have less money to fall back on during their retirement years. As a result, more women tend to be susceptible to energy or fuel poverty, since investing in energy-efficient measures can quickly become a financial burden. Women are also more likely to live alone in their retirement ages, which can exacerbate this problem even further. Women play a critical role in the energy management of households, not only because they have specific responsibilities associated with gender roles prescribed by society (e.g. household tasks, childcare, cooking), but because they tend to be more environmentally-aware.

All REPLACE campaigns targeting the heating sector should thus make sure that gender and energy poverty aspects are duly considered when designing specific measures. Providing investment assistance, independent energy advice services, and guidance and information can greatly reduce the burden on energy poor households.

For energy poor households behavioral changes that impact energy consumption are the low hanging fruit to be exploited first. That means that the REPLACE local working group might consider option to increase awareness on such measures by appropriate means. Here is listed what can be done, see Handbook for Energy Consumers[4].

Energy savings do not always require significant investments of capital. Sometimes, it is enough to follow some simple tips and to adopt environmentally friendly habits to save up to 20 % on your energy consumption for home heating.

Few examples from the list of recommendations include the following[5]:

[1] EU Energy Poverty Observatory, 2020. What is energy poverty? Available: https://www.energypoverty.eu/about/what-energy-poverty .

[2] Berger and Matzinger, 2020. Energiearmut – Frauen sind besonders betroffen, aber unsichtbar. Available: https://www.gender-blog.de/beitrag/energie-armut-frauen .

[3] Robinson and Caitlin, 2019. Energy Poverty and Gender in England. A Spatial Perspective. Geoforum 104 (2019) 222-233. https://doi.org/10.1016/j.geoforum.2019.05.001 .

[4] https://replace-project.eu/technology-briefs-for-end-consumers

[5] Energie Tirol, 2016. 20 % Heikosten sparen. Available: https://www.energie-tirol.at/uploads/tx_bh/energie_tirol_handbuch_heizkosten_sparen.pdf .

- Adjust the room temperature: it is enough to lower the temperature of just one degree in the room in order to achieve 6 % energy savings.
- Get the right humidity level in the room: at equal temperature levels, dry air is perceived as colder than moist air. The optimal level of humidity in the room should be between 30 % and 55 %.
- Close the doors to not disperse the heat into colder rooms and close shutters, which are an additional heat protection, especially in buildings with bad windows.
- Lower the temperature at night, especially if your home gets warm again quickly in the morning.
- Do not heat cellars and garage: they are usually poorly insulated and that is why the energy consumption in there is usually three to four times that of a living room. If the rooms are not used, you should avoid heating them.
- Ventilate the room by opening the windows, during the right time. Rooms minimum 10 minutes, preferably in the warmer hours in Winter and colder in Summer, or after waking up. When more people are at home, longer times are suggested. This allows fresh air to enter the room and avoid cooling: in the heating season, the colder the outside temperature, the shorter the ventilation time.
- Install seals or replace the old ones: old windows and doors can be the cause of drafts and heat losses. Installing gaskets saves energy costs and increases comfort.
- When and where possible, install thermostats and control systems, like valves on the radiators to set the desired temperature, radiator thermostats which quickly react to temperature changes in the room, radiator thermostats with time programming functions and/or individual to each room.
- Remove objects which might cover the radiators (i.e. curtains on a wall radiator, carpets on the floor heating) and regularly clean the radiators from dust.
- If you hear a gurgling in the pipes or radiators, the heating should be vented. You may be able to do this yourself with a ventilation key or, if in doubt, have the installer do it for you. Venting can also be carried out on underfloor heating manifolds.
- You should also consider whether it does not get warm enough in individual rooms when the radiators are fully turned on. This can be an indication of a lack of hydraulic balancing of the heating system, which can be carried out by an installer and which alone can save a good 15 percent or more of energy costs.
- Can the valves no longer be opened and closed? Then the installer should definitely do it!

Carry out a professional inspection of your heater once per year to ensure good maintenance and prevent undesired failures.

Simple, isn’t it?

Rebound Effects

Policymakers have often expressed concern that energy efficiency (EE) policies sometimes do not achieve the intended impact due to the rebound effect. Energy efficiency-related "rebound effects" refer to the tendency of consumers to increase their use of energy services in response to the EE

measures that had initially reduced their energy costs[6]. Rebound effects can be sub-divided into two main categories:

- Direct rebound effects: the increase in consumption of the targeted energy service due to lower cost (e.g. heating more floor space or setting the thermostat at a higher temperature), and
- Indirect rebound effects: increased consumption of non-targeted services due to a rise in disposable income (e.g. using the saved money to buy more appliances or engaging in other CO_2-emission inducing activities, like traveling).

Despite this consumer tendency, energy efficiency policies can, however, be designed to counter high rebound effects be designing targeted policy measures and packages. There have been many studies conducted to identify the main drivers behind this phenomenon of rebound effect and the type of policies needed to mitigate the effects.

Some researchers have shown that the installation of heat pumps as an energy-saving measure in households does not always lead to the predicted savings, because customers tend to turn up the thermostat to make their homes warmer or they tend to use their heating systems for a longer duration in the winter season. Energy savings can also be limited, since heat pumps are often installed in the process of a larger home renovation that also increases the floor space of the home[7].

Heating systems are linked directly to the comfort level of houses and apartments: the warmer the temperature, the increased perception of the "cosiness" and liveability of the space. As a result, homeowners, who end up installing renewable energy systems as a replacement for fossil-fuel based systems for convenience, costs and comfort reasons, may end up having higher heating bills due to increased room temperatures. Some individuals might also refrain from turning off their renewable energy heating system during the night or when they are away; this can be called the comfort-related rebound effect.

Heat pumps, in particular, can result in additional energy costs over the course of the year, since some consumers use the heat pumps to cool floor space in warmer summer months. As opposed to traditional log-wood ovens or boilers, new wood pellets heating systems require very little effort: you do not need to go out into the cold to harvest wood or manually refuel the oven. Modern pellets heating systems provide central heating units that can easily heat the entire floor space. Due to this convenience, individuals tend to heat throughout the heating season, thereby increasing the heating costs, so that they do not have to wait for their houses to reach a comfortable temperature after not being home for a while. Previously, individuals would only heat one central room or the bedrooms to reduce the burden of refilling the fuel.

From the stakeholder interviews conducted previously in REPLACE, one can see that some technologies, which were not suitable for the living space, were installed, resulting in higher than normal energy costs. Policymakers should keep in mind that an intended reduction in energy consumption might still lead to an increase in costs due to the tendency of consumers to increase their comfort level. Policies should be designed to counteract or mitigate the rebound effect by encouraging consumers to shift to overall greener consumption patterns and to reduce their overall consumption. The rebound effect can also vary quite strongly from household to household and among income

[6] de la Rue du Can, S., McNeil, M. & Leventis, G., 2015. *Rebound Effects in the Context of Developing Country Efficiency Programs. Final Report.,* s.l.: Lawrence Berkeley National Laboratory.

[7] Winther and Wilhite, 2014. An analysis of the household energy rebound effect from a practice perspective: spatial and temporal dimensions. Available: https://core.ac.uk/download/pdf/81884316.pdf .

groups: low-income households, which tend to reside in poorly-insulated homes, tend to be more cost sensitive (i.e. have higher price elasticity)[8].

In the last years, energy smart meters and sensors are being installed in many EU homes to obtain data from the energy consumption and the humidity and temperature conditions. Simple information provided frequently has demonstrated to help consumers to better understand their consumption pattern and change their behaviour, mitigating rebound effects. Having energy metering systems before and after renovation would support understanding the real impact of the more efficient system improvement. Cost signals, as the calculation in economic terms of the savings, is a simple way to inform consumers on the economic benefits reached. Also, CO_2 impact and other information can be provided to increase awareness towards national and EU targets.

Lock-In Effects

The term „lock-in" is used to describe an unwanted situation in which consumers are unwillingly bound to a specific product or service. In the heating sector, this phenomenon can be seen where customers are bound to a heating system type and fuel until the end of its long lifespan. In many cases it can be observed that customers stock up on fuel, when the price is low, and are thus unwilling to switch to another heating system before it breaks. In some other cases, the incorrect technology choice for the type of building can also result in a lock-in situation: a heat pump, for example, should only be installed in buildings that have a thermally-insulated building shell and a proper, i.e. low temperature, thermal output system, otherwise the heating costs can sky rocket. Another lock-in effect in some EU regions is the tradition for installers to install systems based on a specific fuel, as fuel oil or natural gas, making them reluctant to change to different ones (as biomass or other renewables) with better economic figures in the long term for both user and installer-maintainer as well as for the local economy. The REPLACE project targets this aspect by helping and allowing consumers to take an informed and planned decision avoiding emergency lock-in replacements. One solution to avoid such lock-in effects is to use a mobile heating device, which is explained in more detail below.

A mobile space heat and hot water supply system can easily take over the supply without interruption in case of a planned replacement, renewal or maintenance of the heat supply system in a residential building, no matter whether it is a single family house or a large complex, or a floor space extension. Other application areas are the extension of an existing district heating system or the installation of new boilers or equipment in it leading to a shutdown of the original supply systems.

Mobile devices also have another important function. For many years now, the decision for oil boiler replacements have often been taken spontaneously or unplanned as a result of an unsolvable problem, i.e. a boiler break-down. If this happens in the heating season, boiler replacement decisions are uninformed. The quickest solution is then a 1:1 renewal of the existing heat supplier with the same energy source (energy source lock-in). Mobile devices can help ensure that no emergency replacements happen, but that instead unforeseen heating problems are temporarily bridged. End customers gain the time they need to obtain independent and product-neutral advice and are thus able to make more sustainable decisions. This can happen also during heating season without any loss of comfort for end consumers.

In a planned fuel-switch situation, the boiler can be replaced without any problems during the heating season in winter, even without the application of mobile heating systems. The heating and hot water preparation are only interrupted for a few hours. The temperature in smaller buildings does not drastically drop down in just a few hours and hot water demand can be planned accordingly. In case a

[8] Aydin, Kok and Brounen, 2017. Energy efficiency and household behavior:the rebound effect in the residential sector. Available: https://sustainable-finance.nl/upload/researches/Aydin-et-al_Energy-Efficiency-and-Household-Behavior.pdf .

mobile heating device is needed, the rental price to bridge, e.g. the hot water supply is of little consequence in view of the often more favourable conditions for installers in winter. Such mobile devices can usually be offered by installers, especially for smaller properties, and can be rented directly from professional providers for larger objects. Depending on the system capacity, mobile devices are operated with electricity, pellets, gas or oil. Mobile devices are delivered on site on the agreed date, connected to the house installation via flexible and pressure-stable pipes and put into operation. Depending on customer requirements, on-site support including fuel storage management can also be carried out.

A targeted use of mobile heating and hot water systems can potentially also mitigate the problem of the skilled workers' shortage that exists in many regions, because it makes it possible to replace boilers in the last part of the heating season (Jan-May), when installers normally have less to do. As a result, skilled workers can be better utilized seasonally (by-pass operation with bridging system in the heating season; flatten the curve). Such a solution would be of particular interest in larger buildings, where comprehensive thermal renovations tend to pay off. The insulation work would have to be performed before the old boiler is changed by a heating system supplying much less heat load.

2. Activities/campaigns in the project-run

2.1. Overview of activities/campaigns performed

Table 1 gives an overview of the activities that were performed during the boiler and oven replacement campaigns in the pilot regions of the partner countries.

Table 1: Overview of boiler and oven replacement campaigns activities

Activity/pilot region		AT	BG	BiH	HR[9]	HR[10]	DE	NM	SL	ES
1	Labelling of boilers					X	X	X	X	X
2	Techno-economic pre-feasibility studies		X	X	X	X	X	X	X	X
3	Municipal information hubs		X	X	X	X		X	X	X
4	Heating system replacement info at consumer fairs and festivals		X	X	X	X			X	X
5	Cooling system replacement info at consumer fairs and festivals		X							
6	Labelling of 100 % renewable heated houses			X			X	X	X	X
7	Open cellar/house events			X		X	X	X	X	X
8	Regional field trips to best practice RHC systems		X	X	X	X	X			
9	Webinars showing how to use the "REPLACE your Heating System Calculator"		X		X			X	X	
10	Facilitating emergency mobile heating devices	X					X			X
11	Facilitating installers to become contractors					X		X		
12	Facilitating collaboration of installers and contractors		X				X		X	
13	Realisation of collective actions	X		X	X	X	X	X	X	X
14	All-round carefree packages for heating system replacements	X								
15	Tackling financing and affordability issues	X								
16	Information evenings on municipal level				X					
17	Innovative other boiler or oven replacement activities						X	X	X	X

It can be seen that there was a wide variety of activities selected and implemented as joint activities by the local working groups established in the pilot regions. The wide variety of activities reflects the wide range of progress in clean heat transition, framework conditions, cultural habits and consumer needs.

[9] North-West Croatia, City of Zagreb incl. three bordering counties
[10] Primorsko-goranska county

3. Tackling special aspects per country/pilot region

This chapter provides an overview of how issues such as gender, energy poverty, rebound and lock-in have been addressed in the REPLACE pilot regions.

3.1. Austria: Province of Salzburg

In Austria, based on an initiative and aligned with REPLACE local working group members, a web-based one-stop-shop for residential boiler oil/gas/direct electric heating system replacements towards renewable or district heating systems was developed. As a core element of the One Stop Shop, an All Around Carefree Package (ARCP) for boiler replacement has been developed and agreed with installers/boiler manufacturers/equipment wholesalers/ESCOs. This initiative has been a collective action of public and market actors, supported by (public financing and experts of) the Federal Ministry for Climate Protection and the Department for Energy Economics and Energy Consulting of the Office of the Salzburg Provincial Government. The idea has been that the ARCP replacement supplier coordinates and supervises all crafts needed centrally, via one contact person (the installer), on-site and provides all contracts needed either, or acts as a general contractor.

An ARCP includes all services needed in 90% of cases and defines obligatory quality assurance and energy efficiency criteria. Those criteria have also been introduced to tackle the issues this report focuses on. A web platform has been developed to enable households to easily and consumer-friendly request offers from qualified, ARCP changeover providers in their area.

The **following activities**, deemed useful by the local working group, became an **obligatory** part of the ARCP; every supplier signing the terms of participation has to fulfil them.

- mandatory public energy advice to implement solutions that fit best for the site; in Salzburg public energy advisors can be consulted free of charge, before the heating system is replaced
- minimum energy efficiency/saving measures (like “boiler room check measures” that save at least 10-15% of energy, without any loss of comfort):
  - improvement of heating and hot water equipment in the cellar to state-of-the art
  - optimization of the domestic hot water preparation and integration
  - insulation of piping, fittings and valves in the cellar or unheated rooms
  - hydraulic balancing of the whole heating system, performed by the installer
  - adjustment of the heating system and (of an replaced, modern) heating circulation pump to the heating curve, performed by the service technician
  - training of the home owners on the settings and steering of the heating system
- and the offer of mobile heating devices in case of emergency breakdowns within 24 hours after contact.

In addition to the listed obligatory ACRP services, voluntary ARCP services – up to thermal renovation of building(s) (components), cellar or attic clearing, PV, solar thermal, etc. can be offered by ARCP suppliers. These voluntary ARCP services also include some that address financing and affordability challenges, such as the option to pay in instalments rather than a one-off investment, or plant and energy efficiency contracting models. Such services can be helpful for low-income households.

Gender aspects

As described in the introductory text to this report, elderly people often own old and outworn oil, gas or logwood boilers. The majority of elderly people is female. Therefore, the ARCP web platform particularly benefits women. The public energy consultant provides independent and technology-neutral information about the options for switching. Normally this service is provided on site. This means that offline users can also be reached. In addition, public energy consultants often help to fill out forms for the subsidy application. This could also be done by the installer performing the ARCP.

Energy Poverty aspects

The ARCP or the terms of participation (being binding) for (all) ARCP suppliers, respectively include quality assurance items and procedures (see the listed, obligatory ARCP items above) that make it a good basis for boiler replacements in energy poor households for the future. Those households in Austria receive up to 100% of the replacement investment refunded via a (capped) one-off subsidy. The obligatory ARCP services and its quality assurance procedures match the special requirements of this new funding program, as public funds should be used carefully.

Rebound effects

The mandatory public energy advice, being a mandatory item of the ARCP, ensures that households get the whole picture to improve the energetic performance of their house. This includes recommendations on possible measures to improve the energetic quality of the building shell, before or in parallel, the heating system is replaced. The obligatory minimum energy saving (boiler room check) measures, associated with the ARCP, help that at least 10-15% of energy savings are achieved, even if further energy saving measures cannot be taken or are not needed, independent of the climate-friendly heating system installed. The minimum energy saving measures and the training of house owners how to run and steer the new heating system help to increase the awareness on heating and therefore lower rebound effects. Although the new heating system is less harmful to the environment than the previous fossil-fuelled system, the new, clean heating system and the indoor temperature profile should be operated according to actual needs.

In addition, in the course of the REPLACE project, the Austrian Energy Agency (AEA) was able to use REPLACE learnings for the energy saving campaign “mission11”[11] of the Federal Ministry for Climate Action. The federal campaign targets all residents of Austria and contributes to lower rebound effects and saving energy. More specific information, related to the campaign’s energy saving measures can be found on a dedicated klimaaktiv website.[12] klimaaktiv is the national climate protection program of the Federal Ministry for Climate Action. Furthermore, the program is one of the main financing sources of the web-based REPLACE one-stop-shop for residential boiler oil/gas/direct electric heating system replacements towards renewable or district heating systems.

Lock-in effects

The mandatory ARCP provision of mobile heaters in the event of a breakdown avoids the need for emergency like-for-like replacements, and thus avoids the lock-in of fossil fuel or inefficient heating systems as like-for-like replacements can be avoided. In addition, public energy advice is mandatory, as the mobile heating unit helps to bridge a few weeks for an informed decision on a fuel switch. In addition, subsidies for new, clean heating systems are generally only granted if the beneficiary declares

[11] mission11.at

[12] klimaaktiv.at/haushalte/wohnen/energiesparen/heizen-kuehlen.html

(e.g. through an invoice) that the old heating system has been scrapped. The dismantling and disposal of the old heating system is also a mandatory element of the ARCP.

3.2. Bosnia and Herzegovina: Canton of Sarajevo

Gender aspects

While there is a comprehensive legal and policy framework on gender equality, women do not actually enjoy equal rights. Limited attention shall be paid to national action plans for gender equality; They are poorly budgeted and poorly implemented. BiH is characterized by continuous inequality between women and men and they face constant challenges related to discrimination against women (high unemployment rate of women and inactivity rates; unpaid care provided almost exclusively by women; low representation of women in decision-making; very gender-oriented profiles of occupations and education).

Gender equality is an essential factor in achieving sustainable change and, therefore, constitutes one of the key values on which this project is based. In this regard, all activities carried out are conceived in such a way that they are "gender-responsive", thus accessible to both men and women.

Women may face more barriers to accessing information and resources related to heating system replacement, or may have different priorities and preferences for heating and cooling systems than men. Despite potential barriers to accessing information and resources related to heating system replacement, women have displayed more interest and willingness to work on activities to increase energy efficiency, replace heating systems, and environmental protection. However, the challenges mentioned earlier, mainly financial, make it difficult to put concrete measures and activities into action.

The project team ensures that both men and women are well-represented in the project's working groups, and they have equal opportunities to participate in decision-making processes. Additionally, active efforts were made to include female participants and experts/lecturers during the organization of training seminars and the Energy summit. Although gender balance was the goal, achieving it was difficult in a sector where men dominate, but the project maximized the inclusion of women on decision-making positions in certain institutions and experts in the field, highlighting the importance of women in the sector.

Addressing the gender gap in the energy efficiency sector in Bosnia and Herzegovina is important to promote gender equality and to ensure that the country is able to fully leverage the skills and expertise of both men and women in this important field. By promoting gender balance, encouraging female participation, and developing gender-sensitive policies and practices, it is possible to address the gender gap and create a more equitable and inclusive energy efficiency sector in Bosnia and Herzegovina.

Energy Poverty aspects

In BiH, as well as throughout Europe, some of the groups of vulnerable people living in energy poverty are elderly pensioners, single parents, and households from rural areas. Widowed women and displaced families due to the 1992-1995 war in BiH are perceived as categories of vulnerable persons specific to BiH. However, the country has yet to recognize energy poverty as an existing state within its legal framework and has no official national definition.

Today, the number of people facing energy poverty in BiH is estimated at between 30% and 40% at the state level; however, the figures are far from accurate due to a lack of recognition and a mechanism to measure and address energy poverty and vulnerable energy consumers. Figures from different statistics vary between 20% to 40% for different regions of the country. The lack of democratisation of the energy sector, inefficient use of energy and lack of affordable energy contribute to the growth of energy poverty trends, which affects vulnerable people and their rights to health and well-being, and causes social injustice. However, the country has yet to recognise and systematically address the problems that energy poor people have in the country. Another challenge in terms of presenting precise figures is that the situation is hardly measurable, due to the dynamic nature of energy poverty. Many of the vulnerable categories of people who benefit from some form of social state support would usually not be able to provide heating or cover their monthly bills, if we look only at their monthly income, and thus nominally fall into the category of energy poor people.

In this regard, all campaign activities are designed in a way to reach as many people as possible, with a special focus on smaller urban and rural areas, where the number of such categories is significantly higher. Educating the population about the topic was certainly the first step in order to create awareness of the importance and impact of inadequate heating systems on many aspects of human life. The activity of organizing info hubs in the premises of municipalities proved to be a good concept since these are institutions through which a large number of citizens circulate on a daily basis. Members of the project team at these hubs were present at least for 5 days , thus directly providing assistance to end users to, in addition to allocating materials, explain in detail what materials offer, what are the steps when it comes to information related to the replacement of heating systems, how to improve the energy efficiency of the current system and / or facility, and what alternatives are available. Through this activity, great awareness and number of inquiries, it was clear that there is a form of ignorance about topics and all possibilities, and this approach proved to be very successful in reaching energy poor households. Also, it could be concluded that older pensioners stand out as one of several categories of socially vulnerable groups living in energy poverty. In particular, pensioners and women living in rural areas are more vulnerable compared to others.

The activities emphasize that citizens can derive significant long-term benefits, especially in cash savings, from implementing measures to improve energy efficiency. This is crucial because many of the measures currently being implemented by citizens are only effective in the short term, leading to inadequate efficiencies and ultimately higher costs.

By conducting pre-feasibility studies, households were provided with a chance to receive a comprehensive analysis of their heating system replacement, which can greatly assist them in determining the measures they should prioritize to enhance the efficiency of their heating system, as well as in planning their investments.

What is inevitable is that the intensive campaign of educating the population must continue, but also supported by a better reaction of the governing structures through various aspects of financial assistance intended for energy poor households.

Rebound effect

The project activities and materials were designed to focus, besides the replacement, also on preventing energy losses through measures such as conducting energy audits of buildings, installing thermal insulation, replacing wooden joinery with PVC joinery, and checking the efficiency and inspection of the current system. These measures are necessary to achieve maximum energy efficiency of the system and ensure the replacement of the heating system is fully effective. Educational

activities, such as stakeholder training, included presentations highlighting the importance of energy efficiency measures in buildings when choosing a heating system.

During engagement with end users at info hubs, sustainability fairs, and other events aimed at informing them about the replacement, particular attention was given to the current condition of the facility, including its energy performance. This included factors such as whether the building has thermal insulation, the type of joinery installed, the age of the system, and whether system checks are conducted regularly. At each activity, project materials were distributed that contained all the essential information related to the steps required prior to the replacement, ensuring that end users had access to adequate information.

Taking into account the widespread role of using coal for heating with which it is possible to achieve high temperature very quickly, when introducing new systems such as pellet boilers or heat pumas (as the most common alternative options in Sarajevo Canton) can lead to an increase in energy consumption in order to achieve thermal comfort in the same way as was the case with the use of coal. Therefore, the functioning of new systems was carefully explained, including the use of thermostats, night heating mode, and remote switching on/off of the system.

In Bosnia and Herzegovina, there are still no CO2 taxes for households, although Policies such as energy pricing and taxation can be used to discourage rebound effects by ensuring that the benefits of energy efficiency are reflected in the price of energy and that households are incentivized to continue to conserve energy.

Lock-in effect

In addition to the lock-in effect in the energy sector, Bosnia and Herzegovina also faces a lock-in effect in households with regards to the use of coal as a primary energy source. Many households in Bosnia and Herzegovina rely on coal for heating during the winter months, which contributes to air pollution and has negative impacts on public health. Factors contributing to this lock-in effect include the availability and affordability of coal, lack of access to alternative energy sources, and low awareness and knowledge of alternative heating technologies.

In this context, through project activities, careful work has been done to clarify the benefits that alternative, climate-friendly options offer, which, in addition to thermal comfort, include easier handling and temperature adjustment in the facility. It was also emphasized that alternative options require significantly less or no effort in handling the heating system compared to the use of coal, which requires significant physical effort, storage space and constant presence in order to maintain the temperature. The promotion of energy efficiency measures that can contribute to the reduction of energy consumption in general (e.g. thermal insulation of buildings) was made.

Continuous education has been carried out to increase public awareness about the negative impacts of coal on health and the environment. This will help create demand for alternative heating technologies and put pressure on policymakers to take action. However, we have observed that older populations, particularly retirees, offer the greatest resistance to change and consider coal as the only viable option. On the other hand, the younger population is more accepting and understanding of the benefits of alternative, climate-friendly options.

To overcome the lock-in effect in Sarajevo Canton, of highly importance was promotion of the development and implementation of alternative and cleaner energy sources. In addition, engaging and educating stakeholders, including the general public, local communities, policy makers, and energy

industry representatives, creates awareness and support for the transition to more sustainable and cleaner energy sources.

3.3. Bulgaria: Rhodope Mountain Region

In Bulgaria and especially in Rhodope region, domestic heating and hot water supply have substantial social, economic, and environmental impact on people's lives. It was therefore a priority for the project team and LWG to design the replacement campaign in a way (e.g. by focusing on appropriate technologies and practices) that mitigate all these impacts, including energy poverty and gender aspects. Additionally, both the project team and LWG are well aware of the significance of the rebound effect, which in some cases "neutralizes" the majority of the saved energy and emissions, and the lock-in effect, so serious care was taken of these effects.

Gender aspects

In Rhodope region, the majority of households use stoves burning logwood and coal briquettes for heating (and often for cooking). Women typically stay more time at home and take care of household chores. Additionally, elderly people are predominantly female. Women, therefore, experience serious problems associated with logwood-based heating:

- High physical effort to operate the stoves.
- Lost opportunities to spend the time in alternative ways (linked to poverty).
- Exposure to high indoor air pollution.

All REPLACE activities in the Rhodope region aim to promote switching to cleaner, more efficient, and automated or less labour-intensive technologies, such as heat pumps, solar collectors, and pellet boilers. By addressing the abovementioned three problems, such a technology switch would substantially improve the position of women.

Energy Poverty aspects

According to Eurostat, in 2020, 27.5% of Bulgarians were unable to keep their homes adequately warm. This share in Rhodope region is much higher, as the region is a rural one, with low GDP/capita, and the majority of dwellings are single houses with very low energy performance. Considering that the project campaign targets households with old, inefficient, and polluting heating, most likely the majority of these households are energy poor. The underheating of dwellings in the Rhodope region was evidenced by the REPLACE interviews and feasibility studies. Due to the underheating, the high up-front investment in efficient technologies rarely pays back and this makes it very difficult to convince residents to replace their cheap logwood/coal stoves.

In Bulgaria, REPLACE was considered to a large extent an energy poverty alleviation project and all project activities took energy poverty into account. The project team involved one of the most well-known energy poverty experts in Bulgaria. Additionally, REPLACE had a major contribution to two events: 1) Training of mentors on energy poverty, 5th July 2021; and 2) Energy Poverty Alleviation Solutions panel, within 16th ABEA conference, 29-30.11.2022.

The main energy poverty – related activities of REPLACE in Bulgaria were the following:

- Development and promotion of financing schemes and public and private financing sources that allow energy poor households to afford better technologies - energy performance contracting, energy supply contracting, soft loans, grants, etc.
- Focus on cheaper heating, hot water supply, and cooling solutions;
- Use of communication channels that easily reach vulnerable consumers, such as energy poor. These include, for example, information hubs at municipalities and open outdoor fairs.

Rebound effect

Given that the majority of households in the region use logwood and coal stoves, REPLACE targets mainly these households. When they switch to other heating options, the operational heating costs are generally similar to the ones of the old system. In particular, with a logwood boiler the operational costs are lower, with a pellet boiler – higher, and with a heat pump - nearly the same as before. Therefore, for these households, in general no rebound effect can be observed.

On the other hand, for the households using directly electricity for heating and hot water supply, the operational costs of the new heating option may be substantially lower and the rebound effect may be high.

As mentioned above, many cannot afford heating their homes to a comfort level, so a large part of the rebound effect is related to comfort improvement, which is positive. On the other hand, efforts were put to avoid other parts of the rebound effect, such as overheating and indirect rebound effect.

Throughout the campaign it was highlighted that energy efficiency renovation of homes must be implemented before the replacement of the heating system. Additionally, individual energy efficiency measures in homes, measures to increase the efficiency of the heating system, and metering of the energy consumption were recommended.

Many campaign materials and actions raised people's awareness about the importance to save energy and reduce environmental impact of heating. These activities are both very efficient and effective, considering the overall low level of awareness of the population in the region.

Lock-in effect

Examples of lock-in effects were presented to consumers and intermediaries to make them aware of the importance of early heating planning (before the current system urgently needs replacement), and using green technologies.

Emphasis was put on the need to carry out an energy efficiency renovation of the home before selecting the new heating system – this is particularly important for homes with available high-temperature heating networks considering switching to heat pumps. Additionally, it was highlighted that purchasing an inefficient system may become expensive in the long-term, as energy prices are expected to continue their upward trend.

In 2020, one of the most wide-spread deceptions of stakeholders in the Rhodope region was that the best heating choice is natural gas, as it is a clean, cheap, and automated solution. The project team constantly explained the price risk, security of supply risk, and the GHG emissions that will have price implications through the planned ETS II scheme.

3.4. Croatia: City of Zagreb incl. three bordering counties

Croatian local partner North-West Croatia Regional Energy and Climate Agency (REGEA) with LWG members during the lifetime of the project elaborated specific aspects dealing with rebound and lock-in effects and gender and poverty issues, when designing the activities for campaigns. All campaigns targeting the heating sector should thus make sure that gender and energy poverty aspects are duly considered when designing specific measures. Providing investment assistance, independent energy advice services, and guidance and information can greatly reduce the burden on energy poor households.

Project activities were seriously affected with the COVID-19 caused pandemic in terms of slowing down communication and organization of planned meetings with LWG members and other stakeholders. After the adaptation period, in the last two years project activities have started to take place, focusing on meeting live.

At the third meeting of the local working group, which took place on February 19 in the city of Velika Gorica, participants tackled rebound, lock-in, gender and poverty issues as follows:

Energy poverty

- Existing national and regional public calls combined with new ones developed within project REPLACE for increasing energy efficiency and renewable energy will help citizens of weaker financial status;
- Local partner REGEA and LWG members has helped citizens with the Heating REPLACE calculator‘s information; https://vlada.ks.gov.ba/aktuelnosti/novosti/prezentirana-strategija-za-ogranicenje-koristenja
- A short guide was developed for citizens and managers of buildings regarding implementation of energy efficiency measures in households/buildings which do not require investment or require very small investment.

Rebound effect

- through metering and raising awareness on workshops, info hubs, fairs (energy, economic, and GHG savings) efforts will be put forward to avoid overheating
- thermal comfort rebound effect is expected;

Lock-in effect

- helping consumers to take an informed and planned decision avoiding emergency lock-in replacements.
- Promoting only green technologies.

These issues were elaborated within the members of the local working group, and the final selection was made based on the members' opinions on the necessity, but also the possession of conditions for implementation in target area.

It was agreed that above mentioned activities will be carried out through 3 campaigns within Action for boiler & oven replacement campaigns for North-west Croatia as follows below:

1) Intermediary campaign to bridge the gap between citizens and available funding possibilities offered by County governments;
2) Establishment of Citizens Info Hub;
3) On-site information's evenings for end consumers to replace fuel boilers.

These campaigns produced ways for various target groups to get familiar with the renewable energy systems at different occasions.

Energy Poverty aspects

In Croatia, there is still no single and accepted definition of energy poverty, nor is there a defined method for determining and monitoring energy poverty, but there are public policies that deal with (partly) vulnerable consumers (customers). Also in Croatia, there are currently no programs aimed specifically at energy poor households. In various EU documents, the definition is that a household can be described as a household at risk of energy poverty if energy costs represent more than 10% of household income. Energy poverty is most often described as a combination of several factors: low incomes, high energy expenditures and low energy efficiency in the household. Energy poverty is therefore a complex problem that requires an interdisciplinary approach to different sectors: energy, social welfare systems, health care systems. According to data from the Croatian Bureau of Statistics on indicators of poverty and social exclusion in 2019, the at-risk-of-poverty rate in Croatia that year was 18.3 percent, while in 2018 it was 19.3 percent. In Croatia in 2019, 14.8 percent of the population had backlog unpaid utility bills, while for the EU this percentage was 6.2 percent. The causes of energy poverty are rising energy prices, including the use of relatively expensive energy sources, falling income and personal poverty, and the degradation of housing stock (poor energy efficiency) that is not being restored to the extent that it could or should. Issues of vulnerable consumers and energy poverty are mentioned in individual public policies, an overview of which is given below. The Energy Act (OG 120/12, 14/14) in Croatia is aligned with the third energy package of the European Union and provides for the adoption of the Directive, which means that it relies on the criteria for the status of vulnerable energy consumers. However, so far no formally adopted criteria have been prescribed, covering broader categories of vulnerability except criteria for helping vulnerable households meet electricity costs.

The Social Welfare Act (OG 157/13, 152/14) states that all recipients of the guaranteed minimum benefit are entitled to financial assistance in terms of housing costs and related bills and heating. There is also a definition of vulnerable consumers in the Electricity Market Act (OG 22/13), Article 3, paragraph 57 of the Act on the Electricity Market. Customer-consumer of electricity from the household category who, due to his social position and/or health status, has the right to use the electricity grid and/or supply electricity under special conditions. Furthermore, fees for housing costs are prescribed, i.e. Article 31 thereof provides that housing costs (including energy costs) are granted to beneficiaries of the minimum social benefit. These fees are granted by local self-government units in the amount of half of the guaranteed minimum fee. Article 43 sets out a provision on a minimum fee for households heated by wood, under which they are provided with 3 m3 of firewood or granted a sum of money to cover that cost. The decision on such compensation is made by the local self-government unit and is paid on an annual basis.

The Energy Act (Official Gazette, No. 120/12, 14/14, 102/15, 68/18) recognizes households with a higher probability of energy poverty as a category of 'endangered customer' and defines this category as 'energy buyer from the household category who, due to his social position and/or health status, has the right to energy supply under special conditions'.

The Act also defines the status of 'endangered customer' which may have an end customer from the household category who is supplied through a mandatory public service within the universal service and/or mandatory public service of gas supply and/or heat supply service to tariff customers, if persons live in the household of such a customer:

- whom the social affairs authorities have identified the state of endangered social status and the need for that form of social assistance.
- identifying a certain degree of disability, a person with special needs or a person in poor health who may be at risk of life or health due to restrictions or suspensions of energy supply.

According to the Energy Act, the criteria for vulnerable customers are determined by the Regulation on the criteria for acquiring the status of vulnerable energy customers from networked systems (Official Gazette: 95/2015) according to which the status of endangered customer can have the final customer on a networked system from the household category, provided that:

- beneficiary of guaranteed minimum benefit
- a member of a household that is the beneficiary of a guaranteed minimum benefit
- user of personal disability allowance
- lives in a household with a beneficiary of personal disability allowance

In addition, the Regulation emphasizes that the supplier of the end customer in the household category, before issuing the exclusion order, must check the current state of vulnerability of the customer in the competent social welfare center and inform the operator of the system to which that customer is connected.

3.4.1. What is being done on national level in Croatia in terms of energy poverty

Currently, in Croatia there is a benefit for vulnerable energy buyers, i.e. co-financing of electricity costs, which amounts to a maximum of HRK 200 (26,49 EUR) per month, which is defined by the Regulation on the monthly amount of compensation for vulnerable energy buyers, the manner of participation in the settlement of energy costs of beneficiaries of the compensation and the actions of the competent social welfare centers (Official Gazette, no. 102/2015).

It should be noted that from April 1, 2022, a new Regulation on the monthly amount of compensation for vulnerable energy buyers, the manner of participation in the settlement of energy costs of the beneficiary of the compensation and the conduct of the Croatian Institute for Social Work (NN 31/2022) will enter into force, according to which the compensation for vulnerable energy buyers is determined in the amount of up to HRK 400.00 (52,98 EUR) per month. This new regulation will be in effect until March 31, 2023. The fee is provided through the so-called solidarity fee paid by customers of electricity from the household category in the amount of HRK 0.03 (0,04 EUR) for each kWh of electricity consumed, which does not include value added tax (VAT). Solidarity fee is paid to the supplier in accordance with the contract on supply of the final customer, which pays the collected funds once a month to the account of the state budget and is recorded as earmarked funds of the Ministry of Demography, Family, Youth and Social Policy.

The right to heating costs may also be granted to a household or single person who is the beneficiary of a guaranteed minimum fee heated on wood by providing him with 3 cubic meters of wood once a

year or by granting a sum of money to cover that cost in the amount determined by the regional self-government unit.

3.4.2. How local partner REGEA address, prevent or alleviate energy poverty through project REPLACE

In addition to the implementation of energy efficiency measures and the possibility of regulating energy prices, information and education is a necessary instrument in the fight against energy poverty. Raising awareness of the rational use of energy is the key to the success of the implementation of energy efficiency policies which have been addressed through the REPLACE campaigns carried out by local partner REGEA in target regions.

Within project REPLACE and on the national level, a group of households has been identified in Croatia that are more likely to experience energy poverty, namely:

- socially vulnerable households;
- households with single parents;
- households in which pensioners live;
- persons who have been identified with a certain degree of disability;
- people with special needs or people in poor health, etc.

Households on the continent are at higher risk of poverty compared to Adriatic Croatia, and according to the analysed risk rates by activity and age, the most at-risk categories are unemployed and people over 65 years of age.

Through campaign Intermediary campaign to bridge the gap between citizens and available funding possibilities offered by County governments, which was conducted in the target regions, local partner REGEA helped more than 100 end consumers to receive subsidies for a climate-friendly heating system replacement and thus to buy heating systems, solar thermal systems and heat pumps. In the pilot city of Velika Gorica we spread information through a press conference, an information workshop and set up an information hub accessible to everybody interested in the topic. Subsidies provided by local authorities for the installation of systems based on renewable energy sources with the support of REGEA were significant for citizens with poorer financial conditions.

One of the purposes of the campaign, which was established in target regions, was to bring citizens closer to the topics of energy poverty, energy efficiency, renewable energy sources and sustainability. Citizens who are concerned about the expected high rise in energy prices can get advice and information on how to reduce their heating and electricity bills. Persons in charge of info hubs talked to the citizens about energy efficient measures that can contribute to significant energy savings and related costs that can be achieved by changing behaviour.

In addition, info hubs provided other information on the possibilities of financing energy efficiency measures and renewable energy heating systems and which simple measures to start to improve energy conditions in the household. Visitors to info hubs came to get tips for improving energy efficiency with the aim of reducing bills for any of the energy products. The goal is to explain to the citizens and bring closer what they can do to make them more comfortable in the home, while preserving some household income that they could use for other needs that also mean quality of life, perhaps better food, or a few days off in the year.

The main goal of these campaigns was to help end users with low income to lower their energy bills by installing an efficient heating system which will cause energy savings.

Gender aspects

It is crucial to directly involve women, as primary domestic energy users, in renewable energy projects in Croatia. One of the important obstacles are the lack of gender-sensitive policies and scarce training opportunities: By taking a significant amount of time for housework, women have less time for other activities, including renewable energy projects. At the same time, social impact assessments, counselling and policy development often do not suit women as well as other marginalised groups.

Women also do not have sufficient access to information and training, both technical (including installation, operation, and maintenance), and business. To encourage women to embrace renewable solutions, we need to ensure that they have information about the possibilities of necessary installations. Information hubs which were established as part of the REPLACE project in targeted regions in North-west Croatia help them to get a "full package", to overcome technical difficulties. Information Hubs provided independent, technology neutral advice for end consumers with onsite assistance from trained municipal representatives in cooperation with local partner REGEA. In one place end consumers receive technical and economic information on modern heating and cooling equipment, professional intermediaries, get in-depth knowledge including e.g. planning guidance how they can save energy by changing their behaviour and habits.

To support a just transition and encourage innovative business models for clean energy, it is important to ensure that women and men have equal access to finance and consideration in public engagement programmes. The mentioned action was realised through an REPLACE activity Intermediary campaign to bridge the gap between citizens and available funding possibilities offered by County governments, which was conducted by the local partner REGEA in the target regions. County governments in target regions have until now co-financed replacement of old inefficient boilers with new RES heating systems. This positive example of good practice has also extended to the city of Velika Gorica (pilot City of project REPLACE), which for the first time in 2021 announced co-financing of renewable energy sources and energy efficiency measures for citizens. All users had equal access to the mentioned calls. REGEA with REPLACE resources supported county governments in implementing and marketing these public calls and funds, as well as to provide equal support to the citizens/end users who have decided to replace their old heating systems and use available funding.

Talking to citizens, representatives of the working group through various information campaigns organised by the local partner REGEA, concluded that energy policy affects men and women differently. The role of women in the energy transition must be understood and changed. Women face major obstacles in switching from consumers to energy-oriented entrepreneurs, employees and especially policymakers. Gender energy inequality may be further accentuated by national energy policies and labour market patterns. Seeing as energy is the primary source of GHG emissions, extending access to green energy and promoting affordability can therefore be central to the achievement of more inclusive and sustainable development. From an environmental standpoint, women are more energy efficient than men. Women are usually more sustainable consumers and sensitive to environmental and health care. They are more likely to recycle, minimise waste and buy organic food and products with eco-labels. They also attach more value to energy-efficient transport and are generally more likely to use public transport than men. Therefore, women can be key actors in shifting spending towards more sustainable patterns. In this regard, public policies, and new approaches to influencing spending decisions, such as behavioural insights, should consider a gender perspective. Women can also play a key role in the green energy transition as responsible consumers, particularly in the household, but also in business and policy making. Women’s empowerment and

leadership in the energy sector could help accelerate the transition to a low-carbon economy by promoting clean energy and more efficient energy use, as well as help to tackle energy poverty. Target regions are currently on the way to learning more about these obstacles to identify optimal solutions thanks to the project REPLACE.

Rebound effects

The project focuses on replacing heating systems while also implementing energy-efficient measures such as energy audits, thermal insulation, and efficient joinery installation. Educational activities were conducted to emphasize the importance of energy efficiency measures and to provide information on the steps required prior to replacement.

The above-mentioned situations were communicated by the local partner REGEA with local government units at informative events, through established info hubs how to encourage building managers and citizens to replace boilers and heating systems. REGEA on the 12th of December 2022 held a presentation at the Energy Center Bračak to building managers / janitors and locals of Krapina-Zagorje County on how to efficiently use energy and manage the heating system in buildings / houses. This educational event was attended by 66 people, and as part of the workshop, participants visited the photovoltaic power plant on the roof of the Zabok General Hospital and the Energy Center Bračak. The times we live in, and the high energy prices caused by disruptions in the energy market require more than ever for us to use energy effectively. Energy efficiency, i.e., smart energy consumption, implies behaviour or habits, procedures and technical solutions that will reduce unnecessary consumption, while ensuring the desired living and working conditions. The first steps and our own contributions to energy efficiency lie in the implementation of simple activities of maintaining heating systems in buildings and changing our behaviour, which ultimately leads to more efficient use of energy and the achievement of energy savings. For this purpose, REGEA has developed short Guidelines for energy efficient management of heating systems in buildings in Krapina-Zagorje County. The guidelines aim to reduce the rebound effect by promoting more efficient use of energy for heating and replacing old and inefficient heating systems with environmentally friendly alternatives. By implementing these measures, building managers and locals can achieve energy savings, which in turn reduces the likelihood of rebound effects. The guidelines emphasize the importance of changing behavior and jointly developing locally appropriate solutions to achieve a more sustainable future.

The project aims to introduce alternative heating systems such as pellet or log wood boilers in North-west Croatia to replace the use of natural gas or fuel oil for heating. However, it is important to note that introducing new systems may lead to an increase in energy consumption if not used efficiently. Therefore, the functioning of new systems was carefully explained, including the use of thermostats, night heating mode, and remote switching on/off the system to achieve thermal comfort while minimizing energy consumption.

Lock-in effects

During the local working group meetings, we talked about situations that create a lock-in effect for owners of multi-apartment buildings. A representative of the Chimney Sweepers Association emphasised that the replacement of the boiler can be complex and problematic in a multi-apartment building. Single-family houses have simpler technical solutions and when it comes to moving from one device/system to another, fewer adjustments are possible and such solutions are less costly, which is not the case in the multi-apartment buildings. Multi-apartment buildings often have complex technical solutions, and without extensive information campaigns and joint coordination of building managers, tenants, designers, installers, and others, it is impossible to replace the boiler, start energy renovation

of the building, or implement other energy savings measures. The process of coordinating and collecting the required documentation takes a minimum of 6 months to a year. Also, some of the cities have special requirements related to the installation of chimneys on the front of multi-apartment buildings. Therefore, before replacing the units and adjusting/repairing common installations, it is necessary to obtain all the necessary permits from the cities/municipalities, which is an additional step in the procedure. Also, it is necessary to make the tenants of the building aware that they cannot independently make changes and modifications to the common installations, which include boiler replacement and the chimney renovation due to the change to another system. For all such interventions, it is necessary to obtain the consent of other co-owners and to harmonise all activities with the legislative framework, e.g., Act on ownership and other property rights, etc. Commission Regulation (EU) 813/2013 regarding eco-design requirements for space heaters and combination heaters, causes a lot of problems and challenges for chimney sweepers. Usually, homeowners with the units whose technical specifications do not comply with the Regulation are not aware of it and the chimney sweepers are the bearers of the bad news. In case of failure of such units, it is not possible to buy repair parts in the EU, nor the same type of boiler units, which requires the reconstruction of all chimneys connected to the shared chimney system and the investment in the new boiler.

North-west Croatia faces a lock-in effect in the use of natural gas and fuel oil for heating in households, leading to air pollution and negative health impacts. Factors contributing to this include the availability and affordability of natural gas and fuel oil, lack of access to alternative energy sources, and low awareness and knowledge of alternative heating technologies. Project activities have focused on promoting the benefits of alternative, climate-friendly options, educating the public about the negative impacts of fossil fuels, and promoting energy efficiency measures. Resistance to change is greater among older populations, while younger populations are more accepting. Overcoming the lock-in effect requires promoting the development and implementation of alternative and cleaner energy sources and engaging and educating stakeholders.

Therefore, as a complete solution, it is necessary to develop a national Program for the Fight against Energy Poverty, which will contain national criteria for energy poverty and the monitoring system of energy poverty. In general, more informative campaigns and education to the general public on benefits of using renewable energy sources for heating and cooling purposes is needed at national regional and local levels. More awareness raising on environmental and social benefits is needed as well. That is an initial and key step to overcome certain barriers and to take advantage of possible opportunities contemporary heating and cooling technologies provide.

3.5. Croatia: Primorsko goranska County

Within REPLACE, issues such as rebound, lock-in effects, gender aspects and energy poverty issues were looked at. In Croatian Primorsko-goranska County, EIHP tried to incorporate and discuss these issues through all the activities. For example, at the 3rd local working group meeting, one of the primary topics were these issues. Additionally, whenever REPLACE was presented at the events, these problems were addressed and proposed measures were suggested.

Gender aspects

Due to existing gender inequalities in society, women tend to earn less over their lifetime than their male counterparts. Consequently, their pensions are also lower. Women tend to have specific responsibilities related to gender roles prescribed by society (e.g. housework, childcare, cooking), which sometimes means that they cannot invest as much time in their careers as men. This all results in more and more women being prone to energy poverty. Therefore, investing in energy efficiency

measures can become a substantial financial burden, which makes the decision for women to invest in it even more challenging.

During the local working group meetings and informing at information hubs, women were particularly interested in energy topics. They proved their motivation for the subject, showing just how important it is to address these kinds of issues to encourage them further.

Some of the proposed measures include removing all stereotypes in communication and promote gender equality, to work on educating all parties to create equal opportunities, and to ensure equal compensation based on performance, rather than gender.

Energy Poverty aspects

During local working group meetings, energy poverty issues were discussed in detail. Some activities that end cosumers can implement include:

- Adjusting the room temperature - by lowering the temperature in the room by one degree, 6% energy savings can be achieved.
- Maintaining an appropriate level of humidity in the room: at equal temperature levels, dry air feels cooler than moist air. The optimal humidity level in the room should be between 30% and 55%.
- Closing the doors to prevent heat from spreading into colder rooms and closing the blinds (they are an additional heat insulators).
- Reducing the temperature at night.
- Not heating the basements and garages because they are usually poorly insulated and therefore the energy consumption there is usually three to four times higher than the consumption of the living room. If the rooms are not in use, heating them should be avoided.
- Ventilating the rooms by opening the windows (in warmer hours in winter and cooler hours in summer).
- Installing seals on windows or replacing old ones: old windows and doors can cause heat loss.
- When and where possible, installing thermostats and control systems, such as radiator valves to adjust the desired temperature, radiator thermostats that respond quickly to temperature changes in the room or radiator thermostats with time programming functions.
- Removing objects that cover radiators (e.g. curtains on wall radiators, carpets on underfloor heating) and regularly cleaning radiators of dust.
- Venting the radiators.

During the local working group meetings, it was also suggested that citizens should call energy providers to find out are there any subsidies for socially endangered groups.

Rebound effects

When consumers make the decision to invest in the new, RES-based system and implement it, there is a danger of them increasing their consumption, as they consider it justified because they reduced consumption by installing a new system. This problem was addressed during the visits to best practice examples. It was emphasized to the homeowners that even though they have a new system, their

consumption should not increase just because their bills have gone down. Further measures were recommended to tackle this problem, specifically to implement room thermostats to be able to monitor room temperature and not exceed recommended values. Additionally, it was suggested to the owners to install thermostatic radiator valves so that their temperature can self-regulate.

Lock-in effects

When citizens find out about the price of new heating systems, they are forced to invest in an old one because of their high capital costs. This usually means that they would rather do a detailed maintenance, or buy the new gas or oil boiler. Even though that new oil or gas boiler system is more efficient than their old one, in the long term it means that not much has changed regarding the emissions. New, RES-based systems achieve energy savings and lower the bills, making them more cost-effective in the long run, but their investment costs are still too high. One of the approaches would be to increase the amount and number of investments today, which would decrease the investment costs in the long run, so other people will be able to buy such heating systems for a lower price in the future. Of course, other than this financial benefit, other end-consumers will see these renewable heating systems, recognize their benefits and make the final step to invest in these systems as well. Another form of encouragement for the consumers who are motivated to invest in new systems would be through subsidizing. Therefore, their amount and frequency of publication of tenders should be increased on local and state level. Finally, the promotion of renewable energy sources in heating should continue, so that the consumers are able to make an informed decision about purchasing a new, climate-friendly option for their heating system.

3.6. Germany: Bavarian Oberland

The framework conditions for heating exchange have developed positively for the REPLACE project in Germany. This also has a positive effect on aspects such as energy poverty, rebound and lock-in effects. At the federal level, a CO2 tax has been in place since January 2021. With the revenue from the CO2 price, private households and companies are relieved via the electricity bill. The EEG levy was capped at 6.5 cents per kilowatt hour in 2021 and at 6 cents in 2022. In addition, in order to relieve energy-poor households and avoid social hardship, the Federal Government relieves housing benefit recipients of heating costs. From 2021, the federal and state governments will increase the funds for housing allowances by ten percent. With a view to the rebound effect, the CO2 tax aims to promote the switch to climate-friendly technologies and to support energy efficiency and energy saving measures in the face of rising costs for fossil fuels. The financial support for the replacement of fossil heating technologies offers a strong incentive to avoid lock-in effects. Thus, the incentive is given to replace outdated heating systems instead of stocking up fuel. And the 1:1 exchange, in which craftsmen in the region install fossil heating technologies out of tradition, is less attractive due to the promotion of climate-friendly technologies.

In addition to the federal initiatives, Energiewende Oberland has put the issue of energy poverty, which affects women in particular, on the agenda of three expert advisory boards in the region. The committees advise the administration on district and municipal level and serve as a preliminary advisory body for the meetings of the district/city council and the committees. Members come from each parliamentary party or committee group, from environment protection associations, the mayor, the city's construction manager, the climate protection manager, city council members, representatives of youth, agriculture and senior citizens, Energiewende Oberland, people from public life, the environmental team, citizen representatives, and foresters. In addition to bringing the topic

to the attention of the advisory boards and discussing it, Energiewende Oberland summarises the results of the three meetings and passes them on at the joint meeting of the climate and energy advisory boards on 27.4.2023. Results include the analysis of particularly affected groups in the region, exacerbated by the energy crisis and inflation (low-income households, tenants without influence on the energy supply, pensioners) and ways of dealing with the issue (low-threshold advisory services, e.g. at municipalities, information on energy saving tips via the press office of the district offices, recommending monthly reserves to citizens, using payment reminders with restraint as an energy supplier, forming an alliance between regional foundations for financial support, informing about the potential for energy saving).

In addition, Energiewende Oberland has added a link to easy-to-implement energy-saving tips from the consumer advice centre, which tenants can implement as well, on the dedicated website www.wärmewende-oberland.de. With the heat turnaround campaign via classic media (posters, newspapers, radio), press releases and mailings to the 88 community newspapers in the region, EWO has comprehensively and continuously promoted the website to the target group in the region.

Figure 1: Energy saving tips

zurück zur Wärmewende-Startseite

Energiespartipps von der Verbraucherzentrale

Sie wollen Energie sparen und damit auch Strom- und Heizkosten? Die Verbraucherzentrale hat einfache Tipps zusammengestellt, mit denen Sie Ihren Energieverbrauch und damit auch die Kosten senken können.

- Einfache Tipps, um die Heizkosten zu senken finden Sie **hier**
- Einfache Tipps, um die Stromkosten zu senken finden Sie **hier**

In order to implement the advice from the energy and climate advisory boards to advertise the offers of the consumer advice centre on the topic of energy saving in job centres, debt counselling centres, food banks, etc., Energiewende Oberland also forwarded the corresponding posters of the consumer advice centre to the climate protection managers of the region. As units of district offices and municipalities, the climate protection managers have access to the local advice centres (job centers, debt counselling centers etc.) and can distribute the posters. The consumer advice centre's energy advice services are independent and free of charge.

Figure 2: Offers from the Verbraucherzentrale Bayern

Lock-in effect

In order to counter lock-in effects, Energiewende Oberland has promoted the use of mobile heating containers in the region. For this purpose, EWO has compiled a list of seven providers from the region and the wider region. The list can be viewed on the dedicated website www.wärmewende-oberland.de. The website and thereby the list of mobile heat containers was advertised as part of the Oberland-wide heat transition campaign (posters, newspapers, radio). In addition, the concept of mobile heat containers and the list of providers was published via a press release to the regional newspapers and a notice to the 88 community newspapers in the region.

Figure 3: Mobile heating containers

zurück zur Wärmewende-Startseite

Retter in der Not - Mobile Heizcontainer verschaffen Zeit für den Heizungstausch

Ihre Heizung ist ausgefallen und Sie brauchen Zeit, um auf ein neues, klimafreundliches System umzustellen? Anbieter aus dem Oberland und der erweiterten Region zwischen München und Augsburg verleihen zu diesem Zweck Mobile Heizcontainer.

3.7. North Macedonia: Skopje Region

Given the circumstances, few of the campaigns and activities have addressed some horizontal aspects such as rebound, avoiding lock-in effects or gender and energy poverty aspects when replacing heating systems, mostly tackled as awareness raising activities.

The gender issue is analyzed in many strategic documents such as the NECP. When defining the policies and measures the gender perspectives should be considered very carefully. The processes of increased gender mainstreaming should be based on the baseline information such as:

- the gender gap remains significant, with about 78% of men participating in the labour market, compared to 52 % of women;
- the largest energy companies in North Macedonia employ a significantly lower number of women compared to men;
- sector Electricity, gas, steam and air conditioning supply – 14,5% women;
- women face specific and greater vulnerabilities due to their different social status and the roles traditionally attributed to them within societies.

There are various factors that can tackle the horizontal aspects and raise the questions for gender equality and energy poverty in the RHC sector and climate change such as:

- Biological (age, disability, health);
- Territorial or physical (therefore the rural population is more vulnerable than the population in urban centers);
- Economic (the poor are more exposed to risks, because they have fewer resources and fewer opportunities to renewal);
- Social (such as models and norms, lifestyles) in family, discrimination, availability of services, etc.);
- Knowledge and information (skills, ways and information channels);
- Political - through participation in decision-making and political power and social inclusion in general.

The gender issue is address also in the document "Gender equality and climate change" prepared within the project "Third biennial updated report on climate change" and the Fourth National Communication towards the UNFCCC, then in a USAID study titled Engendering Utilities: “Improving Gender Diversity in Power Sector Utilities” and in a GIZ ORF SEE Energy Efficiency – “Gender Analysis”, and many others. Additionally in the Program for the implementation of National strategy for energy development each of the measures is linked with Gender Equality and Social Inclusion issues and what are the common implications.

Women, compared to men, often have limited access to resources, limited access to justice, limited mobility and limited voice in decision-making and influence in policy and decision-making processes. On the other hand, many studies show that there is a gendered perception that women show a greater degree of concern towards the negative impacts on climate change than men and show greater motivation for action. Therefore, many of the activities focused on gender issues, as they were actively carried out by women and nonetheless advised many others how to successfully run a transformation and replace their heating system, a process which tends to be more familiar to the male population.

However, with labeling campaigns, webinars and techno-economy pre-feasibility studies no one is left out from the replacement process about various heating options.

The term “Energy poverty” is not defined in the legislation in North Macedonia, so the first objective is to be defined in the adequate Laws and bylaws. The ability of people to secure energy for heating their home reflects the level of energy poverty in the country, but also reflects the development of the energy market in the country. Reduction of energy poverty and protection of vulnerable consumers is ensured with the Energy Strategy stipulated by the Energy Law. This program defines:

- the consumers belonging to the category of vulnerable consumers;
- the measures to be taken to protect vulnerable energy consumers, including energy consumption subsidies intended for households not provided for in the energy subsidy programme in accordance with the social security regulations;
- the measures for energy saving and energy efficiency improvement;
- the manner of implementation of the measures and the competent authorities responsible for their implementation;
- the measures taken by the energy distribution systems operators;
- the measures to be undertaken by the supplier with the obligation to provide a public service i.e. a universal service in the energy supply and
- the necessary funds and financing sources.

In the Energy Strategy, an indicator, Population unable to keep home adequately warm by poverty status (SDG:7_60), was used. According to this indicator, 25% of the population in Macedonia are unable to keep their homes adequately warm. The implementation of the program for vulnerable consumers, as well as the implementation of energy efficiency measures, are expected to significantly improve this indicator. Decrease energy poverty level will be carried through:

- ensuring the implementation of the provisions for protection of consumers (vulnerable consumers) by the suppliers
- stimulating the installations of solar thermal collectors for hot water, especially for the vulnerable customers
- carrying out annual programs for vulnerable consumers, with an appropriate increase in the intensity of the measures, based on annual needs
- introduction of energy poverty as a term in the relevant laws

Regarding the energy poverty aspects, the government has recently repurposed additional finances and improved the subsidy schemes for these households. As a result of the strategic identification of immediate need to address this burning issue in 2021 the Government adopted an annual program for vulnerable consumers. In order to reduce the risk of energy poverty, it is necessary to constantly monitor the vulnerable categories and to adequately adjust the level of subsidies for this category of citizens. The latest updates from the legislation were also communicated through our campaign activities, such as the municipal information hubs and the annual boiler labeling campaign.

The rebound effect and possibilities to avoid lock-in effects were communicated during the panel discussion and roundtables with the key stakeholders and shared with the participants as precaution measures that one could undertake to prevent sudden failure, thus to reduce the overall energy consumption by improving their own comfort.

3.8. Slovenia: Slovenia

During the project duration, JSI and LWG members in Slovenia put in careful thought and consideration of rebound and lock-in effects and gender and poverty issues when crafting the initiatives for campaigns. Every effort to address the heating sector should ensure gender and energy-related poverty are taken into account as part of their strategy. Offering monetary support, independent energy consultations, and direction and knowledge can significantly lighten the load on energy-strapped families.

The COVID-19 pandemic has had a major impact on project activities, especially in terms of reducing communication and disrupting the organization of planned meetings with LWG members and other stakeholders. Throughout several joint and separate meetings with partners, next conclusions were made:

Gender aspects

Elderly people often own old and outworn oil, gas or logwood boilers and are not equipped enough to gather all the necessary information online. The majority of elderly people are female. Therefore, the national REPLACE platform particularly **benefits women**. The public energy advisor provides independent and technology-neutral information about the options for switching. Normally this service is provided on site. This means that offline users can also be reached. In addition, public energy consultants often help to fill out forms for the subsidy application. Additional, in the scope of a collective action "Zamenjaj olje za okolje" two key manuals were prepared:

1) Step by step process of the boiler replacement
2) Key indicators checklist when comparing offers from different providers, prepared separately for biomass boilers and heat pumps.

Energy Poverty aspects

The prepared policy program that integrated REPLACE content into the public call as well as *step by step process of the boiler replacement manual*, respectively include quality assurance items and procedures that make it a good basis for boiler replacements in **energy poor households** for the future. Those households in Slovenia receive up to 100% of the replacement investment refunded via a (capped) one-off subsidy.

Rebound effects

The public energy advice ensures that households get the whole picture to improve the energy performance of their house. This includes recommendations on possible measures to improve the energy quality of the thermal envelope, before or in parallel, the heating system is replaced. The obligatory minimum energy saving (boiler room check) measures help ensure that at least 15% of energy savings are achieved, even if further energy saving measures cannot be taken or are not needed. The minimum energy saving measures and the training of house owners how to run and steer the new heating system help to increase the awareness on heating and therefore lower **rebound effects.** Despite the new heating system being less harmful to the environment than the previous

fossil-fueled was, the clean heating system and the indoor temperature profile should be run according to actual needs.

Lock-in effects

The lock-in aspect was addressed with:

- helping consumers to take an informed and planned decision avoiding emergency lock-in replacements.
- promoting only green technologies.
- establishment of national contact points
- informing about (R)HC heating systems replacements and related REPLACE offers and activities at large consumer fairs
- on-site techno-feasibility studies

3.9. Spain: Castilla y León Region

In Spain, focused mainly on the Castilla y León Region, the creation of a local working group to provide information for boiler replacement towards biomass installations for households as a first outcome. The customisation of the REPLACE labelling for boilers and for households, using and placement of them in the different households and other installations with the organisation/management of the partners allow the information and acknowledgement about biomass use for heating in households. Other activities of REPLACE include feasibility studies, the participation in EXPOBIOMASA and other national and European events.

Gender aspects

Since the project start, Spanish project partners were committed on involving an equal number of female and male participants in the project activities, including working groups, training workshops, technical visits, technical assessment and any other project action. The overall result has been successful in terms of reaching a relevant number of female stakeholders in the REPLACE activities in Spain.

The members of the REPLACE local working group included manufacturers and distributors of biomass boilers, energy agencies and other public authorities; this group with **predominant female members** participated as information points and with the biomass use promotion with the labels created in the REPLACE. The involvement of them is relevant for the gender aspects of the Replace project since the boiler industry has been historically managed by a predominantly male workforce. Having female members acting as public figures, solving issues, and giving advice on this sector may attract the female population to care about the heating and cooling market.

In some of the events that REPLACE organised the participation if women have been predominant. For example, at the EXPOBIOMASA Conference and visits to the Fair, one could appreciate a growing number of female assistants compared to previous years. It is important that more women get involved in these types of events, because women tend to live longer than men and are more prone to energy poverty. Thus, these events are increasing energy knowledge in the female population that could prevent future cases of energy poverty too.

The families and personnel who received the energy labels for boilers and for households has been mainly equal about gender although the women of households were more in favour to place the label in their own home. Also, in residential block buildings, most of the "President *of Comunidad de Propietarios"* are women. This figure is the reference for all the neighbours in a residential block building. As it was stated in the introduction of the report, women tend to care more for the environment and by doing so it has been helpful in the Replace campaign activities involving dissemination and promotion of environmentally friendly alternatives for heating and their community, for example with the boiler labelling.

Energy Poverty aspects

The situation in Spain regarding energy poverty, affects to more than 4.5 million inhabitants in 2022. Since October 2018 with the Real Decreto-ley 15/2018, appeared the social bonus as an economic incentive that is provided for vulnerable families and helps to pay the bill for heating, water heating and cooking. The incentive (BST, Bono Social Térmico) is expected to be between 40€ to 124€ during the year 2023 and to be compatible with other financial aids received for the same purpose. The eligibility criteria to receive the money is explained in the following tables according to three different social groups.

Vulnerable consumers. Those who are in a large family or whose income levels are between the following figures:

	Income
Without minors in the family	< 11.279 €/year
With one minor in the family	< 15.039 €/year
With two minors in the family	< 18.799 €/year

Severe vulnerable consumers: They must have an annual income of less than or equal to 50% of the thresholds established to be considered vulnerable consumers.

	Income
If you are a large family	< 15.039 €/year
Minimum pension	< 7.520 €/year
With two children in the family unit	< 18.799 €/year

Severe vulnerable consumers at risk of exclusion: These are those who, in addition to meeting the income levels of severely vulnerable consumers, receive attention from social services. Their supply cannot be interrupted despite non-payments.

Also, the Government has introduced a policy[13] that reduces taxes to 5% for **biomass heating**, wood logs heating, natural gas and electricity until December 2023. A new financing or other funding schemes as the platforms, *Ecrowd es una Plataforma de Financiación Participativa con licencia de la CNMV*[14]. A investors group financed the biomass boilers for poor families and the owner of the

[13] https://www.lamoncloa.gob.es/serviciosdeprensa/notasprensa/transicion-ecologica/paginas/2023/110123-medidas-contra-crisis-energetica.aspx

[14] https://www.ecrowdinvest.com/detalles/caldera-biomasa-pobreza-energetica-quebinex2-extremadura

household pays monthly quotes for the new biomass heating boiler. REPLACE project helps families to use climate-friendly biomass boilers for space heating and in Castilla y León Region, the partner EREN manages several incentives programmes[15]. Recent ones are included for the period January 2022 to December 2023.

Rebound effects

The biomass use for space heating could increase the number of hours of heating use in some families or increase the temperature, if compared with the previous boiler utilisation, also the use of heating in more rooms when using biomass are identified as rebound effects. The members of the LWG are installers, manufactures, policy makers along with partners who did inform the owners or even when elaboration the feasibility studies try not to incorporate more heating surface; and advising informing the families about the advisable hours the National Energy Agency recommends the comfort temperature in winter season as 19-21ºC.

Furthermore, temperature sensors are installed outside the installations "outdoors" that execute the *on-off of the boiler* by a fixed temperature that is usually the recommended conform temperature; the increase of the hours for using the boiler seems to be low or reduced. Another type of rebound effect is that many families, we suppose, usually refrain from turning off their renewable energy heating system during the night or when they are away; this is called the comfort-related rebound effect.

Lock-in effects

The advantages of mobile heating devices in case of breakdown situations, such as avoiding emergency like-for-like replacements and therefore a lock-in of fossil-fuelled or inefficient heating systems. Furthermore, public energy advice is obligatory, as the mobile heating device helps to gather time for an informed decision on a fuel-switch.

EREN did manage incentives programmes dealing with energy efficiency and renewable energy sources. They included subsidies for boilers using renewable energy sources as biomass and these systems are also included in the programme of economic incentives ("ayudas").

15 https://www.tramitacastillayleon.jcyl.es/web/jcyl/AdministracionElectronica/es/Plantilla100Detalle/1251181050732/Ayuda012/1285096607543/Propuesta