

Your Guide to Efficient Heating



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Heating Appliances Retrofit Planning

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1 PROJECT SUMMARY

The HARP project, Heating Appliances Retrofit Planning, aimed at raising consumers awareness to the opportunities offered by the planned replacement of their old and inefficient heating appliance. The main goal was to support the consumer in the identification of the energy (in)efficiency of their current heating appliance and the saving opportunities that could derive from its replacement with a more energy efficient solution. The mission was to contribute to accelerate the European replacement rate for heating systems, actively contributing to the reduction of energy demand in buildings, in line with the energy efficiency targets set by the EU.

Now is the time to act and raise consumers' awareness about the opportunities of a planned replacement. Taking advantage of the energy label for space and water heating, the labelling concept was mainstreamed to the installed heating stock, allowing to use a well-known support decision tool to communicate and motivate the consumer to replace his/her heating system with modern highly efficient and renewable solutions. HARP accompanied the consumer decision process, providing an impartial message, based on the energy label and presenting the market solutions that best responded to the consumer's heating needs, providing a quantified approach for economic and non-economic benefits and bridging the gap with the market providers and available national incentives.

HARP was promoted by key knowledgeable partners in the fields of consumer behaviour, energy efficiency, heating solutions and business models, working directly with the consumer, or indirectly via professionals who are critical multiplying agents.

2 EXECUTIVE SUMMARY

This document describes the results of the HARP project, from the initial goals to the strategy adopted, resources developed, initiatives implemented and results achieved, bearing in mind the goal of supporting the consumer's decision to plan the replacement of its old and inefficient heating appliance with more efficient and renewable sourced solutions.

After two heating season communication campaigns, organized in the five HARP focus countries, nearly 9 million consumers were reached with the efficient heating message, more than 35.000 labels issued for existing heating appliances and more than 18 thousand consumers simulated new heating solutions for their homes.

In the end, the main goal of the HARP project is to contribute to accelerate the energy transition of the heating sector and to this end, the EU policy context was analysed in depth to foresee and draw potential policy integration strategies for the adoption of the energy labelling of existing heating appliances as a successful initiative to support the consumer in the replacement decision process.



3 THE HARP PROJECT – GOALS AND STRATEGY

The HARP project main goal was to motivate individuals to plan the replacement of their often outdated and fossil-fuel operated heating appliances, with more efficient and renewable alternatives. The baseline for the HARP concept relied on EU data regarding poorly performing heating stock, roughly around 60% of the installed space heaters performed as a C or below and the replacement rate of these appliances was around 4%, clearly below the necessary to accomplish EU goals regarding energy transition and addressing climate change challenges. Additionally, consumers lack of knowledge about the energy performance of their current heating appliance and new solutions on the market motivated the definition of the HARP project.



Heating and hot water represents 80% of the energy demand of EU households.



inefficient boilers (class C or lower).



informed about the efficiency of their installed heating systems.

Figure 1 – The HARP baseline framework

The HARP aimed at promoting consumers awareness regarding energy efficient heating solutions, inviting them to know more about their current heating systems and plan the potential replacement of their heating system with more efficient and renewable solutions, relying on the energy label, a well-known and established support decision tool as the main instrument to communicate energy efficiency.

3.1 HARP GOALS

The HARP project defined the following goals:

SO1 Reach over 1.5 million consumers with HARP resources

SO2 Influence the heating system renovation process in existing buildings of more than 10.000 consumers, by promoting the labelling of their installed heating solutions

SO3 Develop methodologies to label existing space and water heating solutions, in line with the EU heating labelling regulations

SO4 Engage with the heating sector supply chain, to guarantee the endorsement and use of the HARP methodologies and tools at the EU and national levels

SO5 Develop and make available, in the five participating countries and at EU level, an online application that accompanies the customer decision process to purchase of new heating systems



SO6 Provide the European Commission and the 5 participating Member States public authorities with policy integration scenarios on how to integrate the labelling methodologies for installed heating systems at the EU level

SO7 | Nurture a network of experts in heating and consumer behaviour, at a national and EU level

SO8 Influence public authorities responsible for the management of energy efficiency support schemes to include heating systems in their energy efficiency measures portfolio



Figure 2 – The HARP in numbers

3.2 HARP STRATEGY

To accomplish the goals presented, the HARP approach considered fives steps:

1. Awareness: raising consumers' interest in the heating topic

Define the Consumer Theory of Change Model, identifying the key issues when communicating efficient heating and the most successful communication channels

2. Quantification: labelling the existing heating system

Establish a methodology to calculate the efficiency and energy class of space, water, and combi existing heaters, according to the EU labelling regulations

3. Overview of solutions: presenting the most efficient heating technologies on the market

Assessment of the currently available heating solutions in the market with the support of the heating industry

4. Analysis of benefits: providing information on potential energy, money, and CO₂ savings

Estimate potential energy, money and CO₂ savings achieved with the replacement of the old existing heating systems, identifying the energy class of the new systems in the market and the added co-benefits presented by the different heating technologies

5. Motivate the replacement: extending the information to professionals and incentives

List professionals available that can support the consumer and provide a technical solution for an effective replacement and identify/link to the nationally available incentives to replace old and inefficient heating appliances.



4 THE HARP PROJECT ACTIVITIES

To pursue HARP's goals and implement the defined strategy, the HARP consortium enrolled on the following activities:

- Definition of the **consumer behaviour change model** regarding the adoption of heating systems
- Analysis of the heating stock in European households and current market offer of heating solutions
- Evaluation of the **co-benefits** associated with energy efficient heating solutions
- Labelling methodologies for the classification of existing heating appliances: space, water and combi heaters
- HARPa, online application (with different user profiles for consumers and professionals)
- Materials toolbox about energy efficient heating solutions for consumers and professionals
- Two heating season communication campaigns Feb/May 21 and Oct21/April 22
- Policy Integration scenarios for the energy labelling of existing heating appliances in the EU and MS context

These activities are briefly described in the following sections.

4.1 CONSUMER BEHAVIOUR CHANGE MODEL

To successfully raise consumers' awareness to the energy efficient heating topic and communicate the importance of replacing old and inefficient heating appliances it is essential to reveal the perceived factors that influence consumers decision to change to an energy efficient heating appliance (EEHA), as well as the most effective communication channels to attend this topic. To this end, the HARP consortium defined the consumer behaviour change model within HARP's focus countries: France, Italy, Germany, Portugal, and Spain, which allowed customizing the communication and interaction strategies to motivate consumers to make this change.

Methodology

To accomplish the objectives, the following methodology was followed:



Figure 3 – The HARP consumer behaviour change model methodology

After the selection of the variables to include in the model, the final conceptual model was created. This model allowed an understanding of what drives people to change their behaviour regarding their heating appliance. Based on the reviewed literature, experts' discussion, and some initial analysis, the figure below represents the conceptual model (already estimated).





Figure 4 – The HARP consumer behaviour change model

Results

From the consumer behaviour model, it is possible to identify the most influencing factors for consumers to change to an EEHA in each country (ordered according to their importance):

France - Campaigns from national authoritie - Energy labels - Information about available types o - Savings - Co-benefits	s and energy agencies of equipment	Germany - Comfort at home and perceived comfort by the consumer - Campaigns from national authorities and energy agencies - Improve energy performance - Social opinion - Ease maintenance and use				
Italy - Comfort at home - Increase the energy efficiency of the house - Social opinion - Receive information about available types of equipment	Portuga - Comfort at home - Easy maintenance au - Campaigns from nati and energy agencies - Receive information types of equipment	al nd use ional authorities about available	Spain - Receive information about the available types of equipment - Social opinion - Easy maintenance and use - Increase energy efficiency of the house - Comfort At home			

Figure 5 – The HARP consumer behaviour change model, results per country

From the detail of the individual country models, it is possible to identify common criteria that should clearly be endorsed in the consumers engagement campaigns:

- **Co-benefits:** Individuals who are more willing to spend extra money to achieve some co-benefits, present a greater intention to change to an EEHA.
- Influencers: If people they know and value, think it is important to adopt an EEHA, then consumers intention to change to an EEHA will increase; The most valuable communication channels for consumers who intend to change to an EEHA are people that they know and own an EEHA.
- Local organizations and energy agencies: More communication from organisations and energy agencies augments consumers intention to change to an EEHA; The most valuable communication channels are the local organisations and energy agencies.



As for the most relevant communication channels, they also vary within the HARP focus countries and can be identified in figure 4.



Figure 6 – Most relevant communication channels for EEHA promotion per country

4.2 THE HEATING MARKET

4.2.1 THE HEATING STOCK IN EUROPE

The European residential stock, considering the European Union and the UK, had, in 2017, a total surface of residential floor around 22.7 billion m², 86% of this heated, housing 512.4 M citizens. The surface area is distributed into 248 million dwellings: 125 million of single-family houses and 123 million dwellings in multi-family houses.

The heating energy demand is covered by 160.5 million of heating appliances, 76% of which are fossil fuel boilers. Gas boilers are the most common solution, with 58% of the stock, evenly distributed between condensing gas boilers, 45.5 million and non-condensing gas boilers, 47 million.

The total installed energy capacity in the EU is 4.66 TW, 83% covered by fossil fuel boilers, and the final energy consumption is 2,316 TWh.



Figure 7 – Share of space heating appliances in the EU, 2017.



Considering centralized and autonomous systems, autonomous appliances are the focus of the HARP project. They represent 83% of the installed units, 60% of the installed capacity, 68% of final energy consumption and 67% of the heated living area.

As for water heating appliances, there are 93 million units installed in the EU+UK, 75.9 million of which are electric water heaters and 20.8 million are gas water heaters, a number solely referring to water heaters and not combi appliances.



4.2.2 NEW ENERGY EFFICIENT HEATING SOLUTIONS ON THE MARKET

The heating market has evolved significantly in the last 20 years. The heating energy label entered in force in 2015, making it easier for the consumers to perceive the most efficient solutions on the market. So, the question addressed is 'replace the existing heating stock with what?'. The building sector is indeed hard-to-decarbonise, due to buildings' extreme heterogeneity and to the variety of factors affecting buildings' users/owners (individual preferences and financial means), local energy systems (sizing, access to energy grids, local availability of renewable resources), and buildings themselves (age, levels of insulation, possibilities for deep or staged-deep renovations and, consequently, varying heating needs).

Biomass boiler Condensing boiler Heat pumps Hybrid heating system Solar Thermal



Figure 9 – Portfolio of new heating solutions on the market.



To cater for this diversity, technological development in renewable energy-based and highly energyefficient technologies has been at the forefront of the heating industry innovation. This innovation ranges from green gas and hydrogen-compatible heating systems to solar thermal, from hybrids to electric and thermally-driven heat pumps, from combined heat and power and fuel cells to biomass boilers, all of which can be operated by digital, smart system controls for added efficiency, end-user as well as energy grid interaction.

Today, modern technologies such as condensing boilers and thermally-driven heat pumps can run on biomethane without any adaptation. Moreover, they are ready to work with blends of methane and hydrogen of up to 20% hydrogen by volume. Hydrogen-ready boilers are also staring to appear on the market and more solutions are expected in the next few years. These are gas appliances that are installed as normal gas appliances but, can operate safely and efficiently using 100% hydrogen following a reconversion with a conversion kit and re-commissioning process in situ.

Combined heat and power (CHP), such as micro-CHP or fuel cells, contribute to reducing energy consumption and CO_2 emissions, as this technology aims to produce heat and power simultaneously. Micro-CHP can be used in commercial and public buildings, apartments, individual houses and in some cases even in small collectives of houses. Fuel cells also achieve very high energy efficiency levels and already work with 100% hydrogen.

Whether they are electric heat pumps or hybrids systems (i.e., combined with a condensing boiler) have a huge potential for decarbonising buildings. While electric heat pumps can be installed in buildings that are well insulated, especially new buildings that can meet the energy performance requirements, hybrids systems are an opportunity to address and decarbonize also poorly insulated buildings.

Solar thermal collectors convert sunlight into heat, which is then used to produce hot water, heat or even to cool buildings. Most solar thermal systems work in combination with a heater, for example a condensing boiler or a heat pump, which operates when the heat demand is too high for the solar system alone. Such systems can also be easily combined with biomass and reach even higher efficiency levels. Modern heating systems use biomass in the form of pellets, wood chips or split logs.

Finally, modern water heaters, hot water storage tanks, surface heating and cooling and radiators can also bring comfort and flexibility as they are efficient technologies providing great energy savings. They are all combinable with modern heating technologies and renewable energy.

4.2.3 CO-BENEFITS OF ENERGY EFFICIENT HEATING SOLUTIONS

The most common argument for promoting energy efficiency investments, such as the replacement of heating systems, is mainly related to the potential energy and economic savings achieved. However, there is a wide range of other known effects directly associated with this type of investment. These effects are known as "co-benefits", "ancillary benefits", or "non-economic benefits" and can be determinant in promoting the change needed to successfully address climate change and its effects.



Co-benefits are defined as potential additional benefits to the consumer arising from the technical and physical specific characteristics of the heating systems (production).

The relevance of the co-benefits in consumers' decision-making processes and the willingness to pay for one or more additional benefits that replacing a heating appliance can bring were identified for a better understanding of what aspects consumers identify as the ones that bring most added value.

The following co-benefits were identified:

- **Reduction of environmental impact** Improved environmental performance regarding energy and associated carbon emissions
- **Real estate added value** Improvement of the market value of the property after implementation of the heating solution
- Improved air quality less harmful gases, particulates and microbial contaminants which can harm occupants' health
- Thermal comfort Improved thermal comfort regarding adequate room temperatures and relative humidity
- Independence from energy prices reduced exposure to energy price fluctuations
- Improved aesthetics low visual impact on the exterior of the building after the heating system is installed
- Ease of use user friendly maintenance and control of the heating solution
- Gain of the useful area low needs of space for the heating system installation, including storage.

Data collected (from consumer and energy professionals' surveys and literature review regarding the identification of co-benefits and economic valuation methods) allowed a better understanding of the relevance of some co-benefits in distinctive national contexts.

The co-benefits commonly indicated as the most relevant were thermal comfort, indoor air quality and contribution to the reduction of environmental impact. However, there are particularities for each context. Results from France indicated that the most relevant co-benefit is related to the increased added value of the building in the market. For Spain, results showed that independence from energy prices is a highly valued co-benefit associated with replacing a heating appliance in addition to thermal comfort. The independence from energy prices is also the most relevant co-benefit in Germany.

The results show that, although there is a clear relationship between the degree of relevance of the co-benefit and the willingness to pay for it when selecting a heating solution, this relationship varies significantly depending on the type of co-benefit. Although some co-benefits were reported as relevant, such as the added value of the building in the market, the willingness to pay an additional value for it is reduced. On the other hand, there is a very significant relationship between the degree of relevance and the willingness to pay concerning the co-benefit related to the reduction of



environmental impact. Most responses about this co-benefit indicated high relevance and a significant willingness to invest an additional value for it.

4.3 ENERGY LABELLING OF INSTALLED HEATING SOLUTIONS

The energy label for existing heating appliances is an initiative already endeavoured in some countries. In one case the label is compulsory and in others the labels were developed by industry associations as a voluntary initiative. The existing labelling methodologies differ in the calculation method, the inputs and the outputs, not being harmonized with the energy labelling for heating appliances in force since 2015.

Within the HARP project, the goal was to define energy labelling methodologies that were harmonized with the space and water heating EU regulations allowing for a direct comparison between the energy class and efficiency of old and new heaters. The approach considered the EU labelling regulations, as well as the EN standards in use. Furthermore, two calculation procedures were defined for each methodology: a simplified and a detailed one. The goal was to allow for the use of these methodologies within an online application aimed both at consumers (a simplified version) and professional users (a detailed version).

4.3.1 EXISTING LABELLING SCHEMES

Germany is the first country to have a mandatory label for existing boilers. It applies to boilers older than 15 years with a capacity up to 400 kW. The label is printed with an application connected to the website of the Federal Ministry for Economic Affairs and Energy (BMWi). The Database contains about 6300 boilers with the following information: manufacturer, model, year, rated power, boiler group and type, efficiency, energy class, deadline for the labelling and the replacement.

The Italian manufacturer association ASSOTERMICA, the Spanish industry association FEGECA and the French professional associations COENOVE and ENERGIES ET AVENIR proposed, for their respective countries, different voluntary labels requiring different input parameters and following a different assessment methodology. As output, the Spanish and France labels identify the energy efficiency class, while the Italian label also includes the efficiency value. The energy classes ranges are different: the Spanish ranges between A+ and G, the French between A and D, and the Italian from A++ to E.

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Figure 10 – Existing schemes for labelling existing heating appliances: a) Germany, b) France, c)Spain, d) Italy.



4.3.2 LABELLING INSTALLED SPACE HEATING APPLIANCES

Within the HARP project, the energy labelling for installed space heating appliances was developed to be compliant with the EU heating labelling regulation n.º 811/2013.

The methodology was developed, and two calculation procedures were established, a simplified and a detailed one. As indicated in figure 8, the calculation is the same even if the inputs are different. The essential inputs are the fuel type, the boiler group between "standard", "low temperature" and "condensing", the construction year, and the nominal power. The other parameters needed for the calculation are automatically filled in with default values (from EU standards) as a function of these inputs. As for the nominal power, in case this is not known, a default value is assumed depending on the average capacity of the heating appliance in the user's country (defined from the heating stock statistics). In the detailed version, the professional user can manually introduce all these parameters for the calculation or, if some of these are not available, opt for the automatic fill-in with the default values.





The seasonal efficiency is calculated according to the EU regulation N.º 811/2013 with the only difference of adding a degradation coefficient that considers the ageing of the appliance and the effect of components degradation during the working years of the appliance. The ageing coefficient is defined as a function of the technology (fossil fuel boiler, heat pump, electric boiler), the age and the maintenance level distinguished into "normal" and "bad". The "normal" maintenance considers the procedures as indicated by the manufacturer's maintenance program while the "bad" maintenance is assumed when the maintenance is performed less frequently, or it is not performed at all. The degradation factor has been defined in cooperation with manufacturers and with literature review.

The standard EN 15316-4-1 has been initially consulted for defining the default values of gas and oil boilers, while the standard EN 15316-4-2 was used for heat pumps. The validation process considered 4600 models built between the 1972 and 2019 and has simplified the complexity and number of inputs required from the final user. In addition, three old boilers have been tested in the laboratory to confirm the calculation and the degradation factors.

The average deviation between the simplified version and the detailed calculation is 3%.



4.3.3 LABELLING INSTALLED WATER HEATING APPLIANCES

The methodology for labelling existing water heating appliances was developed in compliance with the EU regulation N.º 812/2013. As in the space heating methodology, two calculation procedures were defined, a simplified and a detailed one. The basic inputs are the water heater type, the age, and the number of inhabitants. The water heater types considered in the methodology are "gas storage", "gas instantaneous", "electric storage" and "electric instantaneous". The number of inhabitants is used to define the proper tapping profile.

In the detailed version, the professional can also specify other parameters needed for the calculation and, also in this case, if some of these are not available, the default values are applied following the EN standards.



Figure 12 – Flow chart of WH appliances.

The water heater efficiency is calculated according to the EU regulation N.º 812/2013, and differently from the space heating appliances, the calculation depends on the WH technology. As for the space heating appliances, the degradation coefficient is added to consider the effect of the ageing of the water heaters. The degradation coefficient is the same as the one of space heating appliances.

The standards EN 15316-4-1, EN 15316-5 and a market analysis have been used to define the default values. The validation has considered about 400 water heaters with different tapping profiles, from 1999 to 2019. In addition, two gas instantaneous water heaters were tested in the laboratory following the requirements of the EU regulation N.º 812/2013 and the standard EN 13203-2.

The validation has found a good agreement between the simplified and detailed calculation, and the results are also confirmed by the laboratory tests.

4.4 THE CONSUMER JOURNEY TOWARDS AN EFFICIENT HEATING SOLUTION

The HARP main goal was to raise consumers awareness of the efficient heating topic and of the importance of knowing their current heating appliance, and to have a plan for its replacement, whenever needed. To that end, several materials were produced directly for consumers and also aimed at professionals, to support their interaction with the consumer. These materials were



assembled as toolboxes and are presented in the next sections. At the centre of the awareness raising strategy was the development of an online application, the HARPa, that allowed the implementation of the consumer journey, from the labelling of existing heating appliances to the identification of potential replacement solutions with the quantification of the direct energy, economic and environmental savings, as well as a list and links to existing incentives and professionals that can further support the replacement process.

The materials toolboxes and the HARPa online application were at the heart of the two heating season campaigns, implemented within the duration of the HARP project. Both are presented in the next sections, as well as the lessons learned.

4.4.1 CONSUMER AWARENESS TOOLBOX

Besides technologies and the mobilization of professionals, the citizen is at the heart of the energy transition process. The HARP project has developed a series of pedagogical materials to raise the interest of consumers, address their concerns and, finally, to invite them to go beyond by changing their heating system or at least initiating its replacement to a more efficient one. This has been done by supporting the consumer in the identification of the energy (in)efficiency of their current heating equipment and the saving opportunities that derive from its replacement with a more energy efficient solution. The materials developed are both technical (factsheets), informational (articles and videos) and user-friendly (serious games or infographics). Implementing common tools at the European level while responding to the realities and specificities of the different countries is inherently complex. Indeed, national situations, aid mechanisms or the experiences of citizens or even the reputation of the different technologies are important things to consider. This is all the truer as national energy options and mixes are different and consumer understanding and interest vary greatly from country to country. One of the major objectives was also to assure that HARP partners were not perceived as "salespeople, sellers of technologies or installations" when inviting a consumer to consider replacing his heating appliance.



Figure 13 – Examples of the materials in the consumer toolbox

All the deliverables of the consumer toolbox were designed by several hands with all the project partners. Each of them translated the materials into their national language while adapting the tools



to their national context or even developing additional tools and materials to respond as closely as possible to the concerns of consumers in each context. All the deliverables are available at the HARP's website: <u>link</u>.

Table 1 – Composition of the consumers toolbox

Material	Use: online/physical			
 5 articles: (1) Reduce your energy bill and environmental footprint with efficient heating (2) What do you value the most when changing your heating appliance? (3) Efficient heating systems – why it is worth investing and what are the benefits? (4) HARPa – A user-friendly and free online tool for consumers to help changing their heating system (5) The HARP Toolbox is available! and the most efficient home heating technologies in less than 1000 words 	 ✓ Online media ✓ Printed media 			
 6 + 1 heating technologies factsheets: (1) Heat pumps (2) Solar thermal heat (3) Biomass boilers (4) Condensing boilers (5) Hybrid systems (6) Efficient water heaters Global factsheet for space heating solutions 	 ✓ Online media ✓ Printed media 			
 2 Serious games: (1) Quiz - The heat you know (2) Memory game – Heat your memory 	✓ Online media			
1 Brochure on efficient heating	✓ Online media✓ Printed media			
 2 Infographics: ✓ 10 Misconceptions about heating ✓ Co-benefits of efficient heating technologies 	✓ Online media			
 3 Videos: (1) Ever thought about planning the replacement of your current heating system? (2) Did you know that smart habits during the heating season can reduce your energy bill and are good for the planet? (3) Save money, time and protect the environment. Use HARPa 	✓ Online media			
PowerPoint presentation: (1) HARP presentation and technologies (2) How to use the tool	✓ Online media			
Material/Plan for the social media campaign (one for each heating campaign)	✓ Online media			



4.4.2 PROFESSIONALS AWARENESS TOOLBOX

Professionals are seen as a key channel to encourage the replacement of old and inefficient heating systems. To reach out to them, introduce the HARP project and raise awareness of the usefulness of the HARPa tool, a series of materials have been developed at European level and is common to all countries. However, each partner has adapted these materials to their national context, to achieve a more effective message.

The materials have been developed in two rounds for each of the two campaigns. In the first one, the training material was prepared, the brochure was elaborated and three articles with different topics were distributed. For the second campaign, the advice and lessons learnt from the first campaign were considered to prepare more effective material: the training material was updated, two more articles were produced and a short tutorial video about the tool was published. All the materials have been also published on the HARP website (here)



Figure 14 – Examples of materials in the professional's toolbox

Table 2 – Composition of the professional's toolbox

Material	Use: online/physical		
5 articles:			
Labelling residential heating appliances Methodology of the HARP online tool for labelling existing heating appliances The heating professionals' role in the consumer's decision process to replace old and inefficient heating appliances HARPa, the best support tool for heating appliance installers The role of installers' associations in the modernization of the EU heating stock	 ✓ Online media ✓ Printed media 		
 Training course (updated for the 2nd heating season). Five modules: ✓ Introduction to the training program ✓ Current situation of space heating appliances in Europe ✓ HARP tool. Methodology ✓ HARP tool. Covering the whole journey ✓ Embedding HARP to your clients 	✓ Online trainings		
1 Brochure for professionals	✓ Online✓ Physical		
Short tutorial video about the HARPa, detailed version	✓ Online		



4.4.3 THE CONSUMER JOURNEY IN AN ONLINE APPLICATION

Convincing the final users to change is always a challenge, but it is necessary if we want to accomplish the energy transition in Europe.

To achieve this milestone, the HARP project and its partners developed an online application to accompany the end users in their journey of planned replacement.

The consortium aimed to develop something simple allowing everyone to estimate the energy class of their current heating appliance and identify possible replacement solutions. Following the labelling methodologies calculations, two versions were implemented, a simplified, aiming at consumers, and a detailed one, targeting heating professionals.

The HARPa online application has two main parts:

- Labelling of the existing heating appliance
- Possible new solutions adjusted to the specific consumer situation (house and inhabitants)

The way through these two parts evolves in five steps:

- Assessing the performance of the existing heating appliance;
- Providing solutions for its replacement;
- Calculating the associated costs;
- Analysing the benefits, direct: energy, energy bill and CO₂ savings, and indirect: co-benefits
- Listing professionals and support schemes



Figure 15 – The HARPa steps in the consumer's journey

In the first part, the end user decides for which appliance he/she is calculating and looking for a replacement. The HARPa app has four options: water heating only, space heating only, combi systems and 2 different appliances for water and space heating.

Once the first decision is made, it is required to choose the country where the building is located and the climate zone. To simplify the choice of the climate zone, the users a map is displayed where the 3 main climate zones are highlighted.

The HARPa application is available for the five project countries (France, Germany, Italy, Portugal, and Spain) and the two replication countries (Greece and Poland).

In the second step, the end user inserts some simple information (type of the appliance, energy used, number of inhabitants) and will receive the HARPa label for the installed appliance, that establishes as output its class and energy efficiency.





Regarding the possible new solutions, the end users are asked for some additional information about the building characteristics and heating needs (type, construction, area) and eventual conditions/restrictions (connection to the gas network, roof/garden availability, electricity capacity).

Once these last questions are answered the user will reach the result page, which provides an overview of the possible solutions that can be installed, complemented with information on potential savings (energy, energy bill and CO₂ emissions), main incentives available in their country and connection with installers or heating professionals that can provide supplementary technical support.

4.4.4 TWO HEATING SEASONS OF COMMUNICATION CAMPAIGNS

In the five participating countries, two active communication campaigns were organized from February to May 2021 and from October 2021 to May 2022. Putting into use the materials developed for consumers and professionals, the focus of the activities was to raise consumers awareness of the energy efficient heating topic (1st campaign) and to motivate them to use the online application and go through the whole consumer journey (2nd campaign). The interaction with professionals was also one of the key points in both campaigns.



Figure 16 – Timeline of the HARP's campaigns

The experiences gathered in these activities are detailed in the next sections, highlighting the most successful resources and strategies.

4.4.4.1 RESULTS OF THE COMMUNICATION CAMPAIGNS

The implementation of the national campaigns followed a country customized approach where the different partners selected and tailored the HARP resources to their countries' contexts and needs.

Within the two campaigns, more than **9 million consumers were reached** with the campaign materials, and this is reflected in the HARPa use with more than **35 thousand labels** issued for existing heating systems and nearly **18 thousand users reaching the HARPa application results page** where the potential replacing solutions were presented.

The campaigns were also quite successful with professionals reaching more than 155 thousand professionals via the media campaigns, of which nearly 1.000 attended HARP training initiatives.

The lessons learnt from the campaigns, regarding the most successful strategies and resources, are detailed in the next sections, both addressing consumers and professionals' campaigns. The overview of the label heating stock within the HARP focus countries is also presented.



4.4.4.2 OVERVIEW OF THE LABELS ISSUED WITHIN THE HARPa

In the initial HARP concept, the data regarding the efficiency of the European heating stock, provided by EHI, indicated that roughly 60% of the installed space heaters performed within a C or below energy class. No information was available for water heaters.

The panorama of the European heating stock can now also be assessed with the statistics from the HARPa use, providing a detailed overview of the energy classes of the heaters, both space and water, assessed via the online application.

The conclusion is that the communication campaigns were effective and really addressed consumers with poorly performing heating appliances, especially regarding space heaters as can be confirmed in the next figures.



Figure 17 – Energy classes distribution of the labels issued in the HARPa

The overall statistics indicate that 93% of the labels calculated with the HARPa online application are for D performing appliances, way above the initial 60% used as reference basis of the HARP concept. As for water heaters, B class presents the highest share of the energy labels issued.

4.4.4.3 CONSUMERS – SUCCESSFUL EXPERIENCES AND LESSONS LEARNT

From the national campaigns for consumers, one of the most relevant feedbacks is that consumers are much more engaged when you offer them something more than just information: for example, for **Spain** it became clear that showing in a video tutorial how HARPa works is more effective than just talking about HARPa or organizing a webinar that also includes other interesting topics for consumers.

All materials and tools used were useful to reach the campaign's objectives. However, often, they needed adaptation to the national context or, in some cases, the creation of new materials. **Portugal**, for example, decided to take inspiration from HARP materials to organize live events about efficient heating, initiatives that were very successful and reached a lot of consumers. In general, the diversity of materials and the efforts made to build an attractive image with a clear message were rewarded by consumers.



Social media and press campaigns (especially paid campaigns) helped to reach more end users to inform and motivate them, as well as live events and videos. Unfortunately, as **France** experimented, sometimes consumers were not confident enough to understand that HARP has no commercial aims. For that reason, the French partners didn't communicate through certain types of social media like Facebook.

For **Italy** the collaboration with an important consumer association made the difference in reaching and engaging consumers: end-users tend to trust consumer organizations that provide practical advice, and therefore, they particularly appreciated the factsheets of efficient technologies.

Similarly, **Germany** found out that articles and factsheets for consumers were a good resource to inform consumers about the advantages and disadvantages of heating appliances. As a result, a high number of consumers calculated the label for their old systems using the HARPa tool.

4.4.4.4 PROFESSIONALS – SUCCESSFUL EXPERIENCES AND LESSONS LEARNT

During the national campaigns, professionals were also targeted, and the information and training activities organized were especially successful thanks to the national cooperation with relevant market actors, engaged in the HARP efforts through the National Experts Forums, in particular professional organizations, and through the engagement of key media. From **Italy's** experience, positive results came from the choice of partners/stakeholders involved and collaboration with everyday activities partners, with whom Assotermica and ENEA had previous contacts.

Training events where the HARP partners provided information not only about the HARP and the energy label for existing heating appliances, but also relating to the obligations at the EU level for energy label and buildings energy performance certificates, were the most successful for **Portugal**.

For **Germany**, a successful way to reach many people was through media services that guaranteed a certain circulation. With articles in professional journals, a high number of persons in this target group was reached. Also, for Spain articles addressing professionals through specialized media of the heating sector were successful initiatives.

In **France**, the modification and national adaptation of the HARPa app were possible thanks to the feedback received from professionals. Following the positive interaction with professionals, the HARPa will partially replace/update the existing voluntary energy labelling system for existing heating appliances.

In general, professionals support was also useful for reaching consumers, as they can guide them in choosing the best heating appliance for their needs and provide practical suggestions.



5 POLICY SCENARIOS FOR THE INTEGRATION OF THE ENERGY LABELLING SCHEME FOR EXISTING HEATING APPLIANCES

5.1 EU FRAMEWORK

The HARP project was conceived starting from the evidence that space and water heating represent 80% of the energy demand of European households, and that, at the same time, 60% of the 126 million boilers installed in Europe are inefficient, meaning the energy efficiency class is C or lower, but individuals are rarely aware of this.

As reported in the "2050 vision for 100 % renewable heating and cooling in Europe" (European Technology and Innovation Platform on Renewable Heating and Cooling, 2020), the decarbonisation of the heating and cooling sector is an essential milestone to achieve the ambitious climate and energy targets of the European Union. In fact, heating and cooling accounts for about half of the total end energy demand in Europe. The annual consumption of thermal energy in Europe in 2017 amounted to about 5.600 TWh, against 2.700 TWh of electricity and 4.000 TWh used in the transport sector. Nevertheless, in the same year, only 19,5% of thermal energy was generated from renewable energy sources (EUROSTAT, 2019).

Policy activities in HARP started from an overall positive European legislative framework, based on the following main pillars:

- The "EU strategy on heating and cooling" (February 2016): the role of heating and cooling in the decarbonisation process is strongly emphasized. A target of a 1,3% annual average increase of Renewable Energy in heating and cooling is set.
- The Renewable Energy Directive sets the target of 32% renewable energy by 2030.

The above-mentioned high-level framework results in several concrete policy instruments, such as:

- the NECP (National Energy and Climate Plan).
- the EPBD (Energy Performance Building Directive): revised in 2018, and a new version expected in 2022, the directive will help reaching the building and renovation goals set out in the European Green Deal.
- plans to fight Energy Poverty.
- Long-Term Renovation Strategies, in which EU countries have defined strategies that foster investments in the renovation of residential and commercial buildings.
- Renovation Wave Strategy.
- Renovation Passports and National Building Energy Certification Schemes.

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 Last but not least, several Member States have plans to phase out from fossil fuels by 2050 (Member States' ambition to phase out fossil-fuel heating – an analysis).

These policy instruments have been at the centre of European-level policy activities in HARP.

In addition, the brand-new <u>RePower EU</u>, the Joint European action for more affordable, secure and sustainable energy, is clearly promoting energy savings in residential buildings and therefore facilitates the dissemination of labelling applications. For example, Repower EU mentions as fundamental goals for the European Member States, "...reducing faster the use of fossil fuels in our homes, buildings, industry, and power system, by boosting energy efficiency, increasing renewables and electrification..." and provide "Free-of-charge advice, inspection, energy audits and energy performance certificates to create awareness and provide recommendation on energy savings, as well as spot checks in thermal heating systems and fast-track maintenance to reduce wastage". It also mentions "Tighten national heating system requirements for existing buildings" and "Introduce national bans for boilers based on fossil fuels in existing and new buildings by setting requirements for heat generators based on greenhouse gas emissions or the type of fuel used.".

5.2 EU POLICY SCENARIOS

Starting from the above-mentioned European policy framework and looking at HARP's results at the National level, the EPBD and the Renovation Passport turned out to be particularly promising for the possible adoption of labelling schemes for existing appliances at the European level.

How can the HARP methodology be integrated into the EPBD and, more specifically into the Renovation Passport? The European Commission will promote a series of guidelines on the Renovation Passport for the Member States. The most relevant extracts from the EPBD related to the Renovation Passport are Articles 10 and 22:

• Article 10 - Renovation passport

By 31 December 2023, the Commission shall adopt delegated acts in accordance with Article
 supplementing this Directive by establishing a common European framework for
 renovation passports, based on the criteria set out in paragraph 2.

2. By 31 December 2024, Member States shall introduce a scheme of renovation passports based on the common framework established in accordance with paragraph 1.

3. The renovation passport shall comply with the following requirements:

(a) it shall be issued by a qualified and certified expert, following an on-site visit;



(b) it shall comprise a renovation roadmap indicating a sequence of renovation steps building upon each other, with the objective to transform the building into a zeroemission building by 2050 at the latest;

(c) it shall indicate the expected benefits in terms of energy savings, savings on energy bills and operational greenhouse emission reductions as well as wider benefits related to health and comfort and the improved adaptive capacity of the building to climate change; and

(d) it shall contain information about potential financial and technical support.

Member States will have to introduce a scheme of renovation passports based on the common framework to be developed by the Commission by the end of 2024, in order to give their citizens access to the use of this tool.

The Member States shall set up national databases for energy performance certificates of buildings, which also allow to gather of data related to building renovation passports and smart readiness indicators. Information from the national databases shall be transferred to the Building Stock Observatory, based on a template to be developed by the Commission.

The Member States shall make simplified procedures for updating an energy performance certificate available where measures identified in a renovation passport are put in place

• Article 22 - Member States shall ensure that the energy performance certification of buildings, the establishment of renovation passports, the smart readiness assessment, the inspection of heating systems and air-conditioning systems are carried out in an independent manner by qualified and/or certified experts, whether operating in a self-employed capacity or employed by public bodies or private enterprises.

In this context, the HARP Consortium already performed various efforts (especially in Germany and Portugal) to find a way to adapt the HARP methodology and promote its use in the Renovation Passport and the EPBD¹. Furthermore, the responsibilities of ADENE within the European Network of National Energy Agencies, as leader of the Buildings Working Group and active participant of the Energy Labelling and Eco-design Working Group can lead to a further wide-reach of the energy labelling methodology for existing heating appliances and its use in national policy instruments. Action plans for Greece and Poland (not directly involved in the HARP project, but participating as replicating MSs) have been developed. HARPa will be used as an informative tool for end users to raise their

¹ HARP Deliverable D6.2 Guidelines for national policy integration



awareness of the potential energy savings related to the replacement of heating systems. If this implementation turns out to be successful, the entities pushing for this initiative will promote its implementation at the public level (through subsidies and/or maintenance procedures). It is expected that having seven European countries actively using the HARP methodology can trigger its utilization in a greater number of European countries.

5.3 MEMBER STATES SCENARIOS

The legislative framework in place in the countries participating in the HARP project - Germany, France, Italy, Spain and Portugal - has been investigated to understand the boundary conditions for introducing energy labelling schemes in each of them. Where such schemes were already in place before the project started, feedback on the existing experience has been collected to support the definition of new schemes and suggest improvements to the existing ones.

In **Germany**, an extensive and long-lasting subsidy scheme is available for the replacement of heating appliances with more efficient technologies. It is managed by BAFA, the Federal Office for Economic Affairs and Export Control. Regular inspections of chimneys are foreseen at least once per year.

A labelling methodology for existing heating appliances is already in place. It is promoted by the government and is mandatory. Chimney sweepers are supposed to issue the label, which addresses only space heaters. The methodology is conceived in a way that the professional issuing the label also provides the end-user with technical information on possible alternatives to the currently installed system. The relatively low reward for this service seems a hindering factor. Another relevant feedback is that the awareness of the low efficiency of the heating device does not seem to be a major driver to its replacement. What really seems to tackle replacement is the availability of incentives.

In **France**, two main subsidy schemes are available to help renovate French houses: the "Maprimerénov" and the "Prime CEE".

Yearly maintenance is mandatory for heating appliances, according to decree N°2009-649. This applies to gas, liquid and solid fuel boilers (therefore including biomass, fuel, gas and wood chips...).

A voluntary labelling mechanism is in place, developed and promoted by Coénove and Energies et Avenir. It is called *Mon Étiquette Chaudière*. The total number of issued labels since its launch is below expectations, but shows that the approach is convincing.

It is worth mentioning that several market players in France have introduced autonomously heating energy labelling services. The most relevant are Engie, Effy and Total.

Italy has a large variety of subsidy schemes, mainly managed by two different public entities. ENEA is responsible for the fiscal deduction mechanisms targeting renovation and energy improvement of



existing buildings, which also cover the replacement of heating systems. GSE is responsible for *Conto Termico*, which among other interventions (e.g., energy improvement of the envelope), also addresses heating and cooling systems.

Domestic boilers are subject to periodical inspections. A compulsory plant booklet must be also issued at the installation or during the first maintenance.

A voluntary labelling system promoted by Assotermica is in place. It focuses on old appliances for space heating and neglects DHW. A past survey from Assotermica among professionals showed that a significant share of interviewees considers the labelling of installed appliances an improvement of the current legislation.

Similar to Italy, also **Spain** has several subsidy mechanisms in place (Real Decreto 691/2021, Real Decreto 853/2021 and Real Decreto 477/2021). The "Código Técnico de la Edificación" defines the technical requirements for building energy efficiency retrofitting activities and it also includes recommendations for heating systems replacement.

A voluntary labelling methodology is in place, developed by FEGECA (the national association of heating appliances manufacturers). This labelling system is however not widespread in the country and is not known by most installers. It is intended to be issued by the technical service of the heating systems manufacturers during the maintenance activities. For the sake of easiness, only boiler age and boiler technology are considered in the calculation of the label.

In **Portugal**, one of the pillars of the national energy and climate plan is to address households' energy refurbishment. The two main incentive schemes in place are Fundo Ambiental – which targets all households owners - and Vale Eficiência - exclusive for energy challenged households, thus targeting energy poverty. Applicants do not have to provide any information regarding the heating appliance to be replaced and expected savings are not estimated. ADENE aims to include the labelling of existing heating appliances in the incentive programmes, establishing the baseline below which the existing appliances shall be considered inefficient and prioritized for funding.

No mandatory maintenance procedure for residential boilers is in place, but a legal obligation for building owners to ensure inspection of the gas network in the building exists and this should be done by a certified professional.



5.4 POLICY INTEGRATION STRATEGIES

From the HARP perspective five policy scenarios could be drawn for the integration of the energy label of existing heating appliances in EU and national public policies:

1. Harmonize the existing systems for the energy labelling of installed heating appliances

The labelling schemes currently in force for installed heating appliances are not harmonized with the EU regulations applicable to new heating solutions. The methodologies developed by HARP are harmonized and as such could be adopted by the existing systems, mandatory and voluntary, to make these systems compatible with the EU regulations, considering both space, water and combi heating, following the same energy scale and as such allowing the consumer for a direct comparison between the existing heating appliance and the new solutions available on the market.

2. Reinforce the link to the Energy Performance of Building Directive

Heating is one of the criteria considered in most EU systems regarding the evaluation and emission of buildings energy performance certificates. The methodology to evaluate the performance of the current heating system is defined at the national level and, as such, there is the potential to harmonize the energy labelling framework with the building energy certification scheme. This would mean adopting the labelling methodology for existing heating appliances in the national buildings certification scheme, allowing to link the information on the building certificate with the products energy label, again providing the building owner with comparable information between the performance of the existing system and new solutions on the market. This would also allow professionals to benefit from the recently launched **EPREL – European product database**, where all the products technical data (for energy label compliance) is available, allowing for a more complete characterization of the heating appliance.

3. One-stop-shops/renovation passports

One-stop shops and renovation passports are two of the tools endorsed in the EPBD to support consumers in the identification and adoption of energy efficiency measures in their houses. The labelling methodology and existing heating appliances classification could also be adopted in this context, fostering the consumer to simulate the energy class of his/her heating system and raise his/her awareness of the renovation potential.

4. Maintenance procedures

Maintenance procedures are compulsory in most EU countries. It is a unique opportunity for the professional to do a thorough assessment of heating appliance and report it to consumers. This assessment can be extended beyond security and operation, also evaluating the energy performance of the existing heating appliance and including this information in the report passed on to consumers, raising their awareness of the (in)efficiency of the system and potential replacement solutions.

5. Prioritize energy efficiency incentives and support the energy transition

Currently, various energy efficiency incentives do not quantify, nor prioritize the most energy saving interventions. Adopting the energy label of existing heating appliances in energy incentives, either for eligibility (only support the replacement of heating appliances with an energy label C or below), prioritization (rank the interventions in terms of the energy efficiency of the current and the new system and prioritize the ones that guarantee the highest energy savings) or incentive surplus (provide extra incentive to the replacement of appliances labelled as C or below), would allow boosting the



replacement of the oldest and most inefficient heating appliances, targeting those more in need and achieving the highest revenues in terms of energy savings per public money invested.

5.5 HARP FOCUS COUNTRIES CASE STUDIES

5.5.1 France

HARP tool is considered by the French stakeholders involved in the project to be more effective compared to *Mon Étiquette Chaudière*. In France, Énergies et Avenir and Uniclima will create a new tool, integrating the HARP methodology and calculations for labelling installed heating systems in the existing *Mon Étiquette Chaudière*. The tool will have a new name, "*Mon Étiquette Chaudière*-*Chauffage*" and will represent an advanced version of the existing tool since it contains the multi-technology approach from HARP. HARP logo and banner will be displayed in the application layout. This decision was supported by the Énergies et Avenir consortium, which decided to step back from the French tool to work on the HARP tool and methodology since HARPa is already proving to have more assets than the French tool currently in place.

The new tool will be presented to the Directorate General of Energy and Climate - DGEC, in the belief that using an application linked with a methodology developed at the European level and endorsed by the French heating industry will open the door to new interactions with French policymakers.

Nacional incentives such as the Maprimerénov and Prime CEE created by the French government could definitively facilitate the spread of the use of *Mon Étiquette Chauère-Chauffage*. Currently, the tool is hard to be integrated into an incentive program because deep changes in the national policy framework would be needed. Nevertheless, it would be interesting to apply the methodology to subsidy programmes and/or maintenance procedures, depending on the installers' and supplier associations' support.

5.5.2 Germany

In Germany, the presence of two different labelling mechanisms (HARP and the national database) led to difficulties in endorsing the HARP methodology and tool in the national policy framework. Furthermore, the competition with other similar mechanisms prevented HARP to be visible at the national level. For example, the Efficiency Class Calculator (<u>Heiszparer</u>) and <u>CO2 online</u> are similar apps that allow the end-users to calculate their heating systems' efficiency.

A possible endorsement which has been considered is through the Renovation Passport, for which the European Commission will set clear guidelines. There is a long list of activities that the German government has to perform for transposing this instrument at the National level. Here the HARP methodology could be included. Potentially, the renovation passport will be mandatory for every big



renovation of residential buildings, and the efficiency increase from the existing to the renovated heating system should be considered.

DENA will promote activities in this direction in the short term. These activities could be triggered by various projects in which DENA is involved: through the <u>iSFP project</u> itself, in cooperation with the BEG office, and through the expert assessment on the further development of the Building Energy Act and the EPBD funded by the BMWK.

5.5.3 Italy

Assotermica is pushing the Italian policymakers since the development of *Etichetta Energetica* in order to include the labelling of existing heating systems in the Italian legislation. The main limit of *Etichetta Energetica* is that it was made by the industry for the industry and therefore it raises scepticism in public administration. Gathering more actors for is development, the HARP methodology is not only promoted by Assotermica, but also validated by a scientific body (EURAC), promoted by a Europeanwide partner (EHI) and supported by ENEA (promoted on the portal, etc.). It is therefore clear that Assotermica is no longer alone in promoting a methodology and a tool to label existing heating appliances and the Italian partners are confident that the barriers encountered so far can be overcome to make the HARP methodology well-established among Italian stakeholders. Assotermica will continue its advocacy efforts, thanks to the contacts established during the HARP duration and will sustain the operation of the methodology with their private funds.

ENEA, together with Assotermica, will further develop the Italian version of HARPa, adding the geographical location of the installed appliances. HARPa will therefore replace Assotermica's application (*Etichetta Energetica*). The HARP methodology will be disseminated through a new application limited to the energy labelling (first part of HARPa), maintaining the HARP logo.

Assotermica will further push after the end of the project for the endorsement at the public level of the HARP methodology and tool. Considering also that no public resources are being requested, Assotermica is confident to maintain interaction with the Ministry of Economic Development and the Ministry for the Ecological Transition. For the Ministries contacted by Assotermica, it is important that the labelling does not turn into a cost for end users. If successful at the private industrial level, there would be the possibility to talk about HARP implementation within a public policy instrument.

5.5.4 Portugal

Since in Portugal there was no labelling methodology available for existing heating appliances, ADENE performed various actions for including HARP in policy, in this case in the Long-Term Renovation Strategy such as meetings, proposals for the use of HARP in subsidies prioritization, a list of public adaptable public fundings ana long-term planning for the methodology self-sustainability.



HARP methodology was successfully endorsed by the Long-Term Renovation Strategy (ELPRE) policy document as a supporting tool to trigger the replacement of existing heating systems. Furthermore, since the ELPRE team must monitor the measures selected by the Portuguese government, ADENE suggested the creation of incentives based on the energy class of the heating systems. The indicator would be the cost per kWh of forecasted energy savings. HARPa's cockpit would be useful for this.

In parallel, ADENE is part of the team responsible for the definition of the transposition of the EPBD into the national context. In this process, there is the potential to harmonize the energy labelling framework with the building energy certification methodology to assess the efficiency of the existing heating system since they are quite different (e.g., seasonal efficiency vs nominal efficiency) and it's not possible to link the information on the building energy performance certificate with the products energy label. Also, the fact that the HARPa is now available in the Portuguese One-stop shop, casA+, can be a push for it to work as a forerunner for its implementation in the EPBD transposition at the National level.

One-stop shops are one of the measures listed in the EPBD to reinforce buildings energy retrofit. In particular, the EU asks for "accessible and transparent advisory tools, such as one-stop-shops for consumers and energy advisory services, on relevant energy efficiency renovations and financing instruments (article 2). HARP is already included in Section "Simulators" and allows the consumers to "Calculate efficiency of your heating system", so that if the consumer finds out that the heating appliance is too old and inefficient, HARPa provides a push so that they can proceed with the replacing process and contact a professional within the one-stop-shop.

5.5.5 Spain

In Spain, the fragmentation of energy-related subsidies at the regional level made clear to the project partners that they should focus on the national energy agency. In fact, IDAE, the National Energy Agency gave positive feedback regarding the potential usefulness of the HARP methodology, but they could not officially endorse it since HARPa promotes natural gas solutions too, which are not part of the Spanish long-term renovation strategy. Nevertheless, AGENEX, the regional energy agency of Extremadura, has been officially using the HARP tool in meetings with residents' associations, in order to inform them about the efficiency of their equipment. The use of the HARPa application has mainly focused on the first section or functionality of the tool: the labelling of the existing heating system. **AGENEX also confirmed, through a signed letter of support, their commitment in continuing using the application and potentially include it in future subsidies scenarios.**

The potential of a private endorsement of the methodology by a national partner of the project - FENIE - is under discussion. FENIE would be especially interested to use the methodology for the training of



professionals, an activity that was implemented by CREARA during the project. An alternative possibility would be to provide training and learning courses for unemployed people, so that they can have a first knowledge of the heating sector, the efficiency of heating appliances and the best appliances to be installed to decarbonize the sector.

6 CONCLUSIONS

The goal of the energy label for existing heating appliances is to communicate in a transparent and easy to understand way with the consumer, taking advantage of a decision support tool already appropriated by users in general since the 90's, the energy label.

To assure a fully harmonized system, the labelling methodologies developed took into consideration the EU labelling regulations for new heating solutions in force since 2015, as well as compulsory and voluntary schemes already implemented in some EU countries. The results are fully harmonized methodologies, that consider the labelling of space, water and combi heaters and introduce a performance degradation factor calculated with the support of the heating industry, using a database of more than 5000 heating appliances and laboratory testing.

The operationalization of these methodologies has been achieved via HARPa, an online application designed to address the final consumer and heating professionals. In parallel, toolboxes of materials for consumers and professionals were produced and adapted to use in the five HARP focus countries communication campaigns, enrolled in February-May 2021 and between October 2021 and May 2022.

The results of these campaigns in the five EU countries and the experiences gathered allowed to identify five potential policy integration scenarios for the adoption of these labelling methodologies at the national level, guaranteeing that this approach can effectively support the energy transition of the heating sector towards more efficient and renewable heating solutions. It also demonstrated that consumers are aware and motivated to heating efficiency topics and are more willing to act when they are well informed about benefits, technologies and can reach for reliable support when needed.