



HEAT PUMPS SKILLS FOR NZEB CONSTRUCTION (HP4ALL)

Report on findings from HP experts surveys &
focus groups

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This document is the summary report of the findings from HP experts online survey and focus groups.

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1 Acronyms and abbreviations

AI	Artificial Intelligence
BER	Building Energy Rating
CEE	Certificate d'Economie d'Energie
CO ₂	Carbon Dioxide
COP	Coefficient of Performance
CTE	Spanish Technical Code of Building
DEAP	Dwelling Energy Assessment Procedure
DHW	Domestic Hot Water
EE	Energy Efficiency
EHPA	European Heat Pump Association
ESV	OÖ Energiesparverband
GHG	Greenhouse Gas
HP	Heat Pump
HVAC	Heating, Ventilation and Air Conditioning
IERC	International Energy Research Centre
LIT	Limerick Institute of Technology
MMV	Monitoring, Measurement & Verification
MS	Microsoft
NEAP	Non-Domestic Energy Assessment Procedure
NSAI	National Standards Authority Ireland
NZEB	Near Zero Energy Building
RD&I	Research Development and Innovation
RES-E	Renewable Energy Systems – Electrical
RITE	Regulation on Thermal Installations in Buildings
SEAI	Sustainable Energy Authority Ireland
SME	Small and Medium Sized Enterprise
SSRH	Support Scheme for Renewable Heating





2 Executive summary

HP4ALL aims to facilitate the massive rollout of heat pumps (HPs) in residential and non-residential buildings by working with the entire HP value chain including both the supply side (manufacturers, engineers, designers, installers) and the demand side (building owners and end users).

To facilitate the development suitable of tools and resources for key market actors in the HP value chain, it is first necessary to understand the current perspective of those HP experts who already work in the sector. The HP4All team designed and carried out a survey in each of the pilot regions (Ireland, Austria and Spain) to compare and contrast the similarities and differences between the countries. The survey was also published by partner, EHPA, with the intention of reaching their network of members that represent HP experts from all over Europe to give a wider, European perspective. This report details the survey design and key results obtained from each region.

The general methodology for carrying out these surveys followed a four-step process:

- 1. Survey design.** A set of multiple-choice survey questions, to be used by each region as a template, was designed and agreed by the consortium. (see Annex 1: Survey questions).
- 2. Conduct surveys.** HP Experts from the HP for all Register of Experts were initially contacted by pilot leaders to participate in the survey. Each pilot region decided on the most appropriate survey methodology to use (online survey, telephone interviews, focus groups or a combination of methods) for their market.
- 3. Create regional report.** The regional leaders collated the data that had been gathered during the surveys into a regional report using the template designed in step 1. Full regional reports are included in Annex 2 to Annex 5.
- 4. Collate regional reports.** All regional reports were sent to project partner, IERC, to analyse and compile into this report which summarises and compares the key results from each region.

In total, 87 HP experts responded to the survey across the pilot regions. There were 14 respondents from Ireland, 15 from Austria, 9 from Spain and 49 completed surveys from around Europe. The majority of the activity is in the planning/design/distribution/installation/maintenance category for Austria (63%) and Ireland (65%). In Spain, this category makes up approximately one third of respondents (34%), and a further one third represent the research sector (33%). In the Europe-wide survey from EHPA, HP manufacturers represented the largest group (35%) followed by those involved in planning/design/distribution/installation/maintenance (25%) and research (16%).

In Ireland, Spain and across Europe, the supportive policy framework was the most commonly selected driver of the HP market (93%, 89% and 71% respectively), whilst in Upper Austria, Awareness raising was the most commonly selected driver (60%). From the focus groups and



in-depth telephone interviews it seems that this difference reflects the different levels of market maturity between the regions. Upper Austria has had a supportive policy framework for many years and has made considerable effort to raise awareness of the benefits of HPs as part of that framework. Ireland and Spain have policies that are driving the HP market in particular sectors but are less advanced in raising awareness of the benefits with key actors in the value chain.

In Ireland the experts identified the lack of qualified and experienced designers, planners and installers as the main barrier to the growth of the HP market (71% of respondents selected this option). The detailed discussions showed that in Ireland, grants are only available to retrofit HPs where the installer is suitably qualified and registered. No such restrictions exist on the installation of HPs in new builds. Ireland has seen significant growth in HPs in new builds due to building regulations, while growth in retrofits is gathering pace with the help of grant subsidies. In Spain and Upper Austria, the high cost of HP installations was considered one of the main barriers (67% selected this option in each country). Although there are subsidies available for HPs in Spain, the rules around eligibility are unclear and this, coupled with the low awareness among end users of the long-term economic benefits of HPs, has hindered growth in the sector. The situation is similar in Upper Austria with the lack of awareness of the economic case for large scale HPs, (particularly when there are several available sources of heat), leading to end-users to preferring to stick to gas-based installations which have a lower up-front cost and are a more familiar technology.

The specific actions that will have the most impact on boosting the HP market in each of the pilot regions will differ from each other since each country's market is at a different level of maturity and exists within its own policy framework. The results of this research suggest that actions for the increase of skills and competences all over the value chain should be taken for the development of the HP market, mainly focusing on the upskilling of installers and designers who might or might not be part of the HP industry. In order to stimulate the development of the HP market, those actions need a supportive policy framework that encourages the transition towards the use of renewable energy sources via, for example, taxation of CO₂, and a regulation of the built environment, for instance, banning fossil fuels in new buildings.

Financial incentives can also play a major role in the development of the HP market, as they are a key enabler for overcoming challenges such as the high cost of a heat pump installation and the high cost of electricity compared to the cost of fossil-fuel-powered systems like gas boilers. Working on raising awareness and making information available to all supply chain actors is considered of critical importance for the development of the HP market, particularly among end-users of HPs. Actions directed at raising awareness should become a priority in order to overcome the end-user's resistance to new technologies and encourage the demand for a transition away from fossil fuel-based systems.





3 Introduction

3.1 Background

HP4ALL aims to facilitate the massive rollout of heat pumps (HPs) in residential and non-residential buildings by working with the entire HP value chain including both the supply side (manufacturers, engineers, designers, installers) and the demand side (building owners and end users). The project will focus on holistically and systemically reducing the energy performance gap in Nearly Zero Energy Buildings (NZEBs) through increasing the level of skills in the HP value chain. HP4ALL will develop a set of tools and resources for use by the different stakeholders which will be tested and validated in different markets through regional implementation in Austria, Spain, and Ireland. The intention is that these resources, which will be tailored to the needs of each market, will drive market change, influence end-user decisions, and accelerate uptake of new innovations and emerging technologies in the HP market.

To facilitate the development suitable of tools and resources for key market actors in the HP value chain, it is first necessary to understand the current perspective of those HP experts who already work in the sector. The HP4All team designed and carried out a survey in each of the pilot regions (Ireland, Austria, and Spain) to compare and contrast the similarities and differences between the countries. This report details the survey design and key results obtained from each region.

3.2 Objectives of the study

The objective of this study is to:

- understand the status of the HP market from the point of view of those currently working in it, determine the key drivers and barriers that are stimulating or restricting the HP market in the pilot regions and beyond.
- understand the importance of particular policies and regulations in driving growth in the HP market.
- compare the similarities and differences between the pilot regions and around Europe to enable the HP for all Competency Framework to be tailored to the needs of each region.

When combined with the “Report on best practices initiatives designed to increase skills in the energy sector” (D2.1) and the “Public and market acceptance report” (D4.1) also written by the HP4All project team, this package of documents will provide a comprehensive examination of the supply and demand considerations for HP skills in the pilot regions and beyond.

3.3 Methodology

The general methodology for carrying out these surveys is described in the following four step process:

1. **Survey design.** A set of multiple-choice survey questions, to be used by each region as a template, was designed and agreed by the consortium (see Annex 1: Survey





questions). The questions and choice of answers were designed to cover all the relevant topics and ensure that the results could be compared between regions. The survey also included free text questions to allow experts to give additional information should they deem it relevant. The consortium also discussed and agreed the structure of the regional report that would be used for reporting the results of the survey. A template was produced detailing the headings to be used, content and analysis of the survey results to be carried for each pilot region.

2. **Conduct surveys.** HP Experts from the HP for all Register of Experts were initially contacted by pilot leaders to participate in the survey. Each pilot region decided on the most appropriate survey methodology to use (online survey, telephone interviews, focus groups or a combination of methods) for their market (as described in the rest of this chapter). This allowed them the freedom to make best use of any existing networks and personal contacts to reach individuals with the right expertise.
3. **Create regional report.** The regional leaders collated the data that had been gathered during the surveys into a regional report using the template designed in step 1. Full regional reports are included in Annex 2 to Annex 5.
4. **Collate regional reports.** All regional reports were sent to project partner, IERC, to analyse and compile into this report which summarises and compares the key results from each region.

As described above, each region took a slightly different approach to the process of contacting regional HP experts and conducting the survey with them. The approach taken in each region is detailed below.

3.3.1 Ireland

The survey designed for this task was hosted online using the online platform Survey Methods. Invitations to take part in the survey were sent via email to the list of known HP experts from Ireland listed in the HP4All Register of HP Experts, and covered multiple disciplines. The survey was 'live' for 10 days, after which time the data from 14 completed surveys was exported from Survey Methods to MS Excel for analysis. The online survey provided the quantitative data presented in the regional report for Ireland.

Following the online survey, a focus group was organised and attended by 6 HP Experts consisting of installers, suppliers, energy agency members, and manufacturers. The purpose of the focus group was to further explore the status of the Irish HP market by sharing experiences and observations.

3.3.2 Upper Austria

In Upper Austria, a total of 20 HP experts were consulted. As first step, the survey was carried out through 15 structured bi-lateral interviews. These interviews provided the quantitative data presented in the regional report for Upper Austria and contributed to identifying key topics for further discussion at the focus group meeting.





A 2-hour focus group was organised by the ESV and held on 26 January 2021 with 21 participants. Participants represented key actor groups along the HP value chain, including suppliers and experts who are also users of heat pumps. The focus group allowed for in-depth discussion and exchange of opinions on the challenges and opportunities for HP market development in Upper Austria. In both the survey and the focus group meeting, particular emphasis was put on larger scale HP applications (commercial and industrial), since developing this market is the main focus pursued in the HP4ALL project for the region of Upper Austria.

3.3.3 Spain

In Spain, a total of 9 HP experts were consulted via bi-lateral video-conference conversations. These experts represented multiple disciplines and were located throughout the country. Each discussion lasted between 30 - 40 minutes. During each meeting, enough information was gathered to provide the quantitative data for the regional report for Spain and to draw relevant conclusions from the experts.

Due to ongoing Covid-19 situation, it was decided that focus groups would not be carried out in Spain. It proved too difficult to bring together several companies on the same day and at the same time and in addition, the individual interviews with experts that had already been carried out provided enough information for this report. Each expert had already had the opportunity to give in-depth detail about their opinions and it was felt that further discussion would not be beneficial.

3.3.4 Europe wide results

HP4All partner, EHPA, has an extensive network of members including HP experts from all over Europe. The survey designed for this task was hosted online using the online platform Survey Monkey. EHPA disseminated the link to the survey via their social media channels as well as through external mailing lists and those of EHPA's members. The survey received a total of 59 replies, however, only 49 participants completed the whole survey. Only complete surveys were used in the quantitative analysis presented here.

4 Survey Results

4.1 Profile of Experts

This section of the report summarises the profile of the survey respondents in each country. In total, 87 HP experts responded to the survey across the pilot regions. There were 14 respondents from Ireland, 15 from Austria, 9 from Spain and 49 completed surveys from around Europe. From Figure 1 we see that the majority of the activity is in the planning/design/distribution/ installation/maintenance category for Austria (63%) and Ireland (65%). In Spain, this category makes up approximately one third of respondents (34%), and a further one third represent the research sector (33%). In the Europe-wide survey from EHPA, HP manufacturers represented the largest group (35%) followed by those involved in planning/design/distribution/ installation/maintenance (25%) and research (16%).





As shown in Figure 2, each country's responses indicate that a large proportion of survey respondents worked in both residential and non-residential building types, with Austria accounting for 47%, Ireland at 64% and Spain at 56%. Fewer experts work in either residential or non-residential buildings only. In contrast, the Europe-wide data from EHPA shows that most of the responders only trade in the residential sector and this may be a reflection of EHPA's membership profile rather than the main activities around Europe.

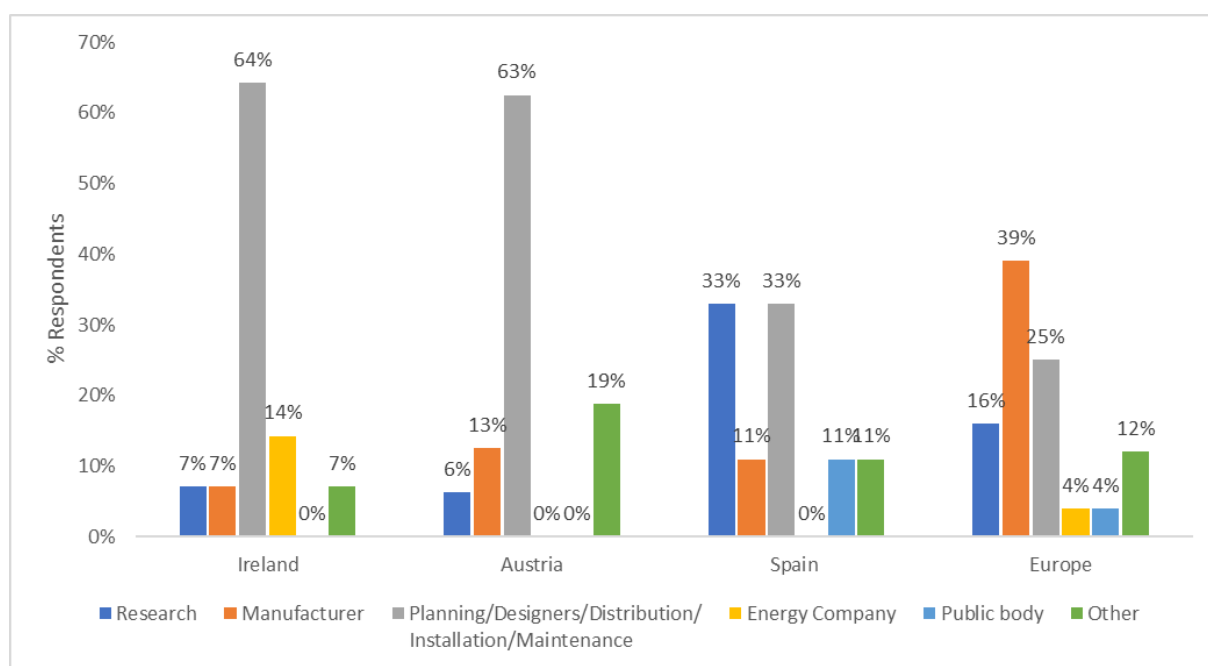


Figure 1: Breakdown of respondents by main activity

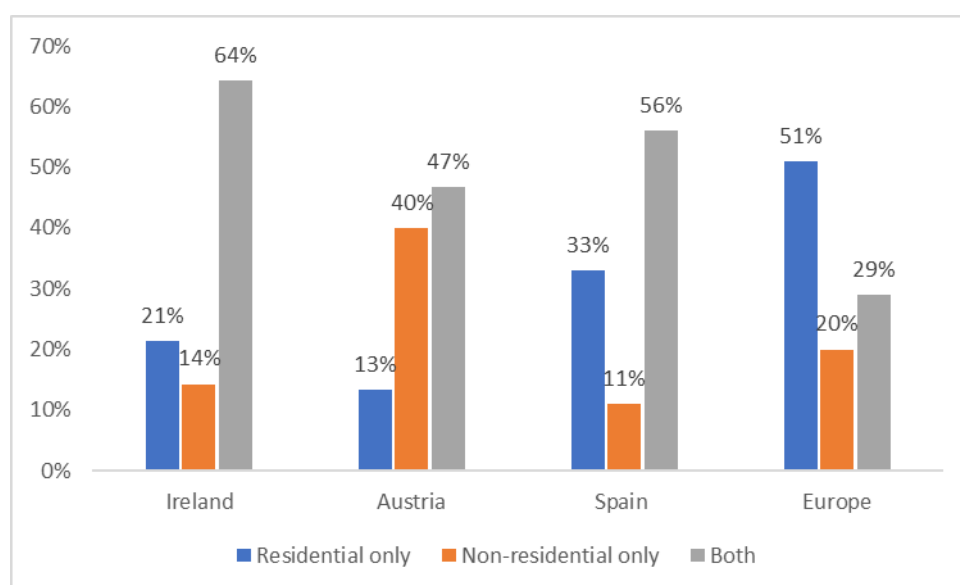


Figure 2: Breakdown of the building types that most respondents mainly work with



4.2 Drivers and barriers in the HP market

4.2.1 Drivers in the HP market

The experts were asked to choose the two most important drivers for HP market development in their region from the following list:

- Supportive policy framework;
- Financial incentives;
- Awareness raising/information;
- Promotion by energy companies;
- Other.

The “Other” category allowed respondents to specify a driver that was not already listed. A summary of the results broken down by region is given in Figure 3 and further discussion on the differences between regions is given in the rest of this section. Having a supportive policy framework was considered to be one of the most important drivers for the HP market in all regions except Upper Austria, where this driver was ranked second only to awareness raising.

IRELAND

In Ireland, 92% of respondents thought that the supportive policy framework was one of the main drivers of the HP market. This largely reflects the high growth of HPs in new build residential properties as a result of the recent tightening of Part L of the Building Regulations, which aim to reduce energy consumption and carbon emissions of new dwellings. Installing HPs rather than other renewable technologies is a cheaper and easier way to meet the requirements of the Building Regulations. Financial incentives are not seen as a major driver for HPs in Ireland and the focus group discussion revealed that one of the reasons for this is that it can be difficult to access the grants due to the level of bureaucracy involved in making the application.

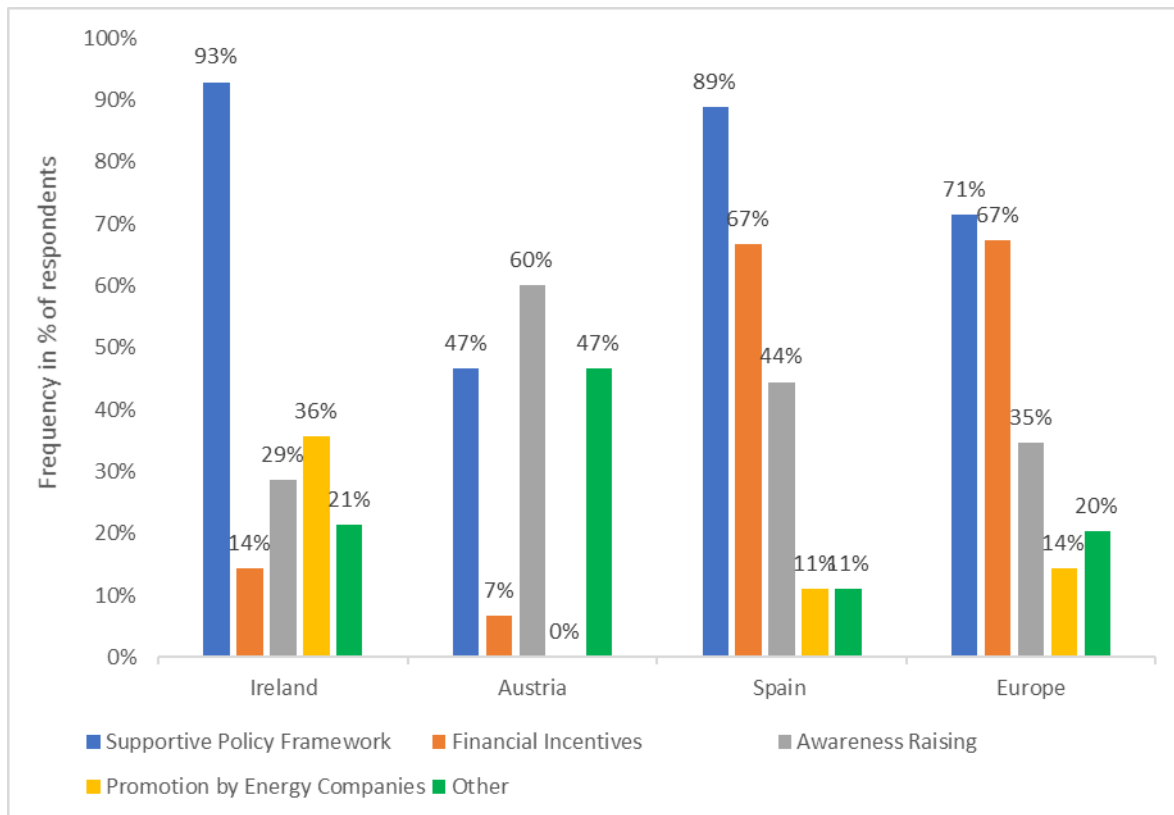


Figure 3: Comparison by country of most important current drivers for HP market development

AUSTRIA

The survey results are in line with the discussion that took place during the focus group. When asked about the main drivers for HP market development, "awareness raising and information" (and notably training services) and "supportive policy framework" (which in Upper Austria includes financial incentives) were mentioned by 60% and 47% of the surveyed experts respectively. This largely reflects the fact that, HPs are already a common solution for new buildings in the region, both in the residential and non-residential sector. The regional government's decarbonisation target, which includes eliminating oil and gas heating, is seen as a key driver. The policy framework that is put in place to achieve these goals (e.g., strict efficiency standards) supports the development and implementation of high efficiency and renewable solutions – including heat pumps.

Experts perceive the fact that HPs are already a favourable and interesting technology for new builds as an important market driver in itself. For new residential and commercial buildings, they are often a suitable, relatively uncomplicated, and economically feasible solution, especially when there is demand for both heating and cooling and flow temperature are low. The growing use of HPs contributes to increasing awareness about this technology, to companies gaining experience with it, and to customers enquiring ever more about further potential application areas.



SPAIN

In Spain, 89% of survey respondents considered that a supportive policy framework is one of the main drivers of the HP market. This reflects the impact of the Regulation on Thermal Installations in Buildings (RITE) and the ability to count some types of HPs as renewable installations for the purposes of heating and cooling. Never-the-less, the experts indicated that there is still some ambiguity around when HPs are considered renewable and when they are not, so further clarity around this point would further drive HP uptake.

Other main drivers identified by HP experts in Spain were financial incentives (selected by 67% of respondents) and awareness raising (selected by 44% of respondents). Financial incentives for HPs are available but in older buildings using these grants and loans for HPs only makes sense when it is combined with an energy efficient building refurbishment, which increases the total cost of the project. Awareness raising and other information services are seen as necessary in both residential and non-residential sectors.

Europe

In the survey conducted by EHPA, a large majority of respondents considered a supportive policy framework (71%) and financial incentives (67%) as the two most important current drivers for the heat pump market development. Around one third of the participants also mentioned the importance of awareness raising (35%). A significant number of the participants that chose the Other category expressed that design, or more concretely, the training on design and installation are the most important drivers at this point in time.

4.2.2 Barriers in the HP market

Survey respondents were asked to select the two most important barriers for HP market development in their region from the following list:

- lack of qualified and experienced planners/designers/installers know how;
- low consumer awareness/resistance to new technologies;
- high cost of installation/lack of financial incentives;
- insufficient regulations requiring fossil fuels transition;
- other.

The “Other” category allowed respondents to specify a barrier that was not already listed. A summary of the results broken down by region is given in Figure 4 and further discussion on the differences between regions is given in the rest of this section. The high cost of installation of HPs is considered to be the main barrier in Austria and Spain with 67% of respondents in each country selecting this as one of the main barriers. In Ireland, the main barrier identified by 71% of respondents is the lack of qualified and experienced planners, designers, and installers and this is reflective of the general opinion of other experts around Europe.



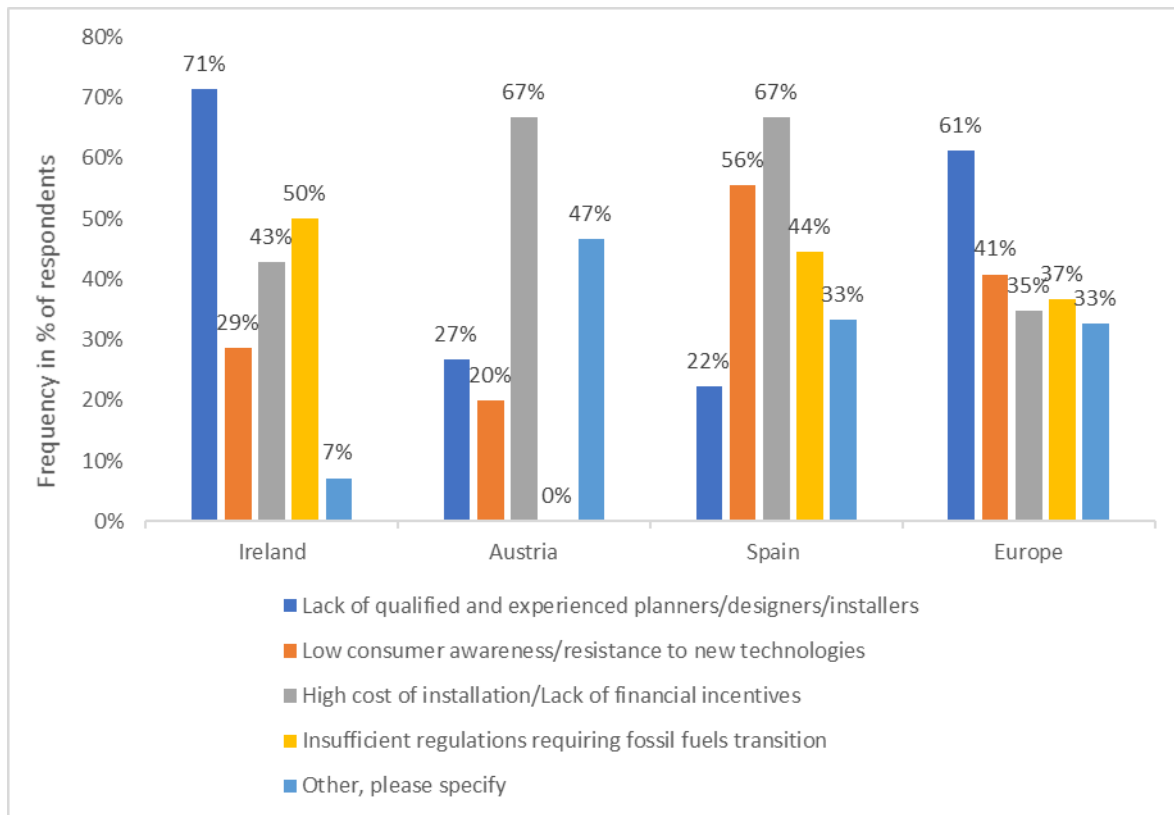


Figure 4: Comparison by country of most important barriers for HP market development

IRELAND

The barriers identified through the online survey were largely supported by the experts who took part in the focus group. Most experts (71%) selected the lack of qualified and experienced planners, designers, and installers as one of the main barriers to growth in the HP market. The sector lacks a standardised approach to the design and installation of domestic HP systems. In the retrofit sector, homeowners must use a registered HP installer in order to be eligible for a grant. Installations are subject to inspection and this is seen as an important link in the chain to ensure the quality of installations. However, there is no such register or inspection process for the installation of HPs in new build properties, which leads to inconsistencies in the approach to designing and installing heating systems. In new build properties it is not uncommon for HPs to be combined with cheap third-party controllers, zoning or on/off controls that ultimately reduce the efficiency of the HP and the effectiveness of the system. There was concern among the experts who attended the focus group that poor quality work would lead to underperforming systems which could ultimately damage the reputation of HPs and hinder growth in the market.

In terms of financial incentives, there was consensus among the focus group that grants available to fund the retrofitting of HPs in dwellings place a high administrative burden on installers and that this can be a deterrent to applying and using a registered installer. They gave anecdotal evidence of prices to the end user being increased by installers to cover this administrative burden which reduced the benefit of the grant to the point where it was not worth applying.



Responsibility for the design of heating systems was also raised as a significant issue by the focus group. For grant aided installations, a technical assessment is carried out by a BER assessor to size HPs, this process doesn't provide for the design of the heat delivery system. For new builds, heat pump sizing is carried out by the installer or their supplier. Radiators have traditionally been sized by plumbers using a variety of methods ranging from detailed calculations to rough rules of thumb. With significant changes to building regulations in recent years that have led to more thermally efficient buildings, and the need for heat pumps to have very accurately sized radiators to ensure optimum performance, this area was seen by the focus group as a major barrier and potential risk as the expected increased number of HP installations increases year on year.

AUSTRIA

The large-scale HP market is still at a relatively early stage in Upper Austria and is faced with the related challenges. The detailed discussions with experts revealed that the most significant of these are low levels of awareness of promising and economically feasible application possibilities among planners and users, and the lack of required skills by planners and installers. As with other energy transition technologies, investment costs present a challenge, especially when compared to gas. In the case of large-scale HP solutions, economic efficiency is often more favourable when several sources (e.g., groundwater, process waste heat) and sinks (i.e., application areas such as heating, hot water, air conditioning, cooling) are used, as well as when operating hours are high.

Experts agree that large-scale HPs have a high technical potential. At this stage, it is very important to raise awareness of end-users, as well as experts, on the range of application areas where HPs are already economically feasible. Also, robust, and qualified planning is important to properly manage the many interfaces between trades and specialists. More knowledge and knowhow on how to better manage these links are needed.

The results of the survey confirm the discussion that took place in the focus group. In the survey, the experts mentioned the "high cost of installation" as currently the largest challenge for market development. Aside from the pre-given categories, one third of the experts mentioned the fact that HPs are often not suitable for the temperature needs for commercial and industry applications – and thereby the low efficiency of the HP system – as a barrier to HPs gaining further market share.

SPAIN

In Spain, the high cost of HP installations and low consumer awareness of the technology were the most frequently selected respondents, chosen by 67% and 56% of experts respectively. For small municipalities and communities, the cost can be a decisive factor in the implementation or otherwise of HP in buildings. Regarding low consumer awareness and the resistance of consumers to new technologies, experts stated that this is especially prevalent among installers of HPs in non-residential buildings. In addition, consumers are not aware of the main advantages of HPs over other heating or cooling systems. This lack of knowledge makes end users and installers prefer to choose technologies that are better known and more thoroughly understood in terms of their maintenance and performance over HPs.





One third of experts also selected the “other” category and stated that lack of clarity and homogeneity in regulations can be a barrier as well as perceived loss of thermal comfort and the need for high temperature delivery systems in commercial and industrial applications.

EHPA

The most frequent option chosen by the survey participants was the lack of qualified and experienced planners/designers/installers know how (61% of respondents chose this option). The second most frequent option was the low customer awareness and the resistance to new technologies (41% chose this option). It is important to highlight that the other options available were only slightly less frequently selected than the second option. Another point of note is that a significant part of the respondents that chose the “Other” option and mentioned the high electricity costs in comparison with gas costs as the main current barrier for growth of the heat pump market.

4.2.3 Regulations

Survey respondents were asked to indicate whether or not policies and regulations are in place to support HP installation, and if so, they were asked to specify. This section describes the main policies and regulations in each region that were identified by the experts as being supportive of the HP market.

IRELAND

The experts surveyed identified 3 main policies and regulations in Ireland that support HP installation:

1. Climate Action Plan (27%);
2. SEAI Heat Pump Grant Scheme (46%);
3. Building Regulations Part L (Dwellings & Non-Dwellings) (27%).

In addition, the focus group identified that the National Standards Authority Ireland (NSAI) intends to release a new standard in March/April 2021 which will bring clarity to the design and installation requirements for commissioning HPs.

During the focus group discussion, the SEAI heat pump grant process was criticized as being arduous and cumbersome, particularly when there is a need to send in supporting documentation to justify non-standard design decisions. For non-domestic heat pumps, the Support Scheme for Renewable Heat (SSRH) provides a capital grant of 30%. The members of the focus group commented that the numbers of installations resulting from this scheme were very low, possibly due to the high costs associated with getting the building “heat pump ready” and the difficulty in dealing with bespoke equipment in the Non-Domestic Energy Assessment Procedure (NEAP).

AUSTRIA

The experts surveyed in Upper Austria described the impact of the following policies and regulations:

- The policy package of the regional government has proved to be successful in Upper Austria for increasing energy efficiency and the use of renewables. It has positively





contributed to the development of the HP sector so far.

- The regional government's decarbonisation target (which includes eliminating oil and gas heating) is also positively seen by professionals in the HP sector. The measures put in place to achieve these goals (ex: strict efficiency standards) supports the development and implementation of high efficiency and renewable solutions.
- Regarding HPs, strict efficiency criteria in funding programmes assure that only high-quality technologies are installed and that the further development of the HP sector contribute to energy efficiency and renewable goals.
- Some experts expressed that fulfilling the criteria for large-scale HP applications can be challenging, thus prevent access to funding. It was also mentioned that subsidies for feasibility studies could be beneficial. Overall, 87 % of the experts consider the current funding situation for HPs as mostly helpful for market development.

SPAIN

The regulations best known by the experts who were surveyed in Spain are the Regulation on Thermal Installations in Buildings (RITE) and technical building code (CTE). In general, the experts expressed the following opinions about these regulations:

- RITE and CTE include many high efficiency technologies and are supportive of HPs.
- While RITE and CTE are supportive, they still need to be developed further and specified more clearly with specific instructions covering a range of use cases.

Europe

More than half of the participants (59%) identified specific policies and regulations in place in their countries that support HP installation. The 29 responses can be distributed in the 6 different groups below:

- **Subsidies:** such incentives for reducing GHG Emissions, increase efficiency, use of renewable energy sources or HP installation.
- **Tax deduction** on Heat Pump installation.
- **Tax** on CO₂ emissions.
- **White certificates:** such as the Certificate d'Economie d'Energie (CEE) in France.
- **Building regulations:** such as the obligation to use up to 50% of renewable energies in new buildings technological systems and banning fossil fuels in new homes.

4.3 Future policies & initiatives needed to drive the HP market

This section of the report analyses the important aspects to scale up the HP market, and which sector should be targeted for up-skilling initiatives. Respondents were asked to "select the two most important actions needed to dramatically scale up the HP market in your country/region?" from the following range of options:

- Increase skills across the HP value chain;
- Simplify the administration of government incentives;
- Regulations requiring the transition from fossil fuels to renewables;



- Increase in end-user awareness of HPs;
- Other.

Those selecting the Other category were asked to specify what other actions they think are needed.

From the responses (see Figure 5) we can see that opinions on the best action to take to boost the HP market differs between the pilot regions. In Ireland, the most frequently selected action was to increase skills across the value chain (design, installation, operation, maintenance) (86%). In Austria and Spain, increased end-user awareness of HPs (80%) and better regulations requiring the transition from fossil fuels to renewables (67%) of the responses were the most frequently selected options, respectively. Across all pilot groups, experts seemed to agree that those working in HP planning, design, distribution, installation, and maintenance should be the main target of any future upskilling initiatives.

The final survey question asked respondents to give details of any further recommendations that they have on how to enhance skills development in the HP sector. The discussion in the rest of this section covers the answers that were given to this question and any supporting information from the focus group discussions.

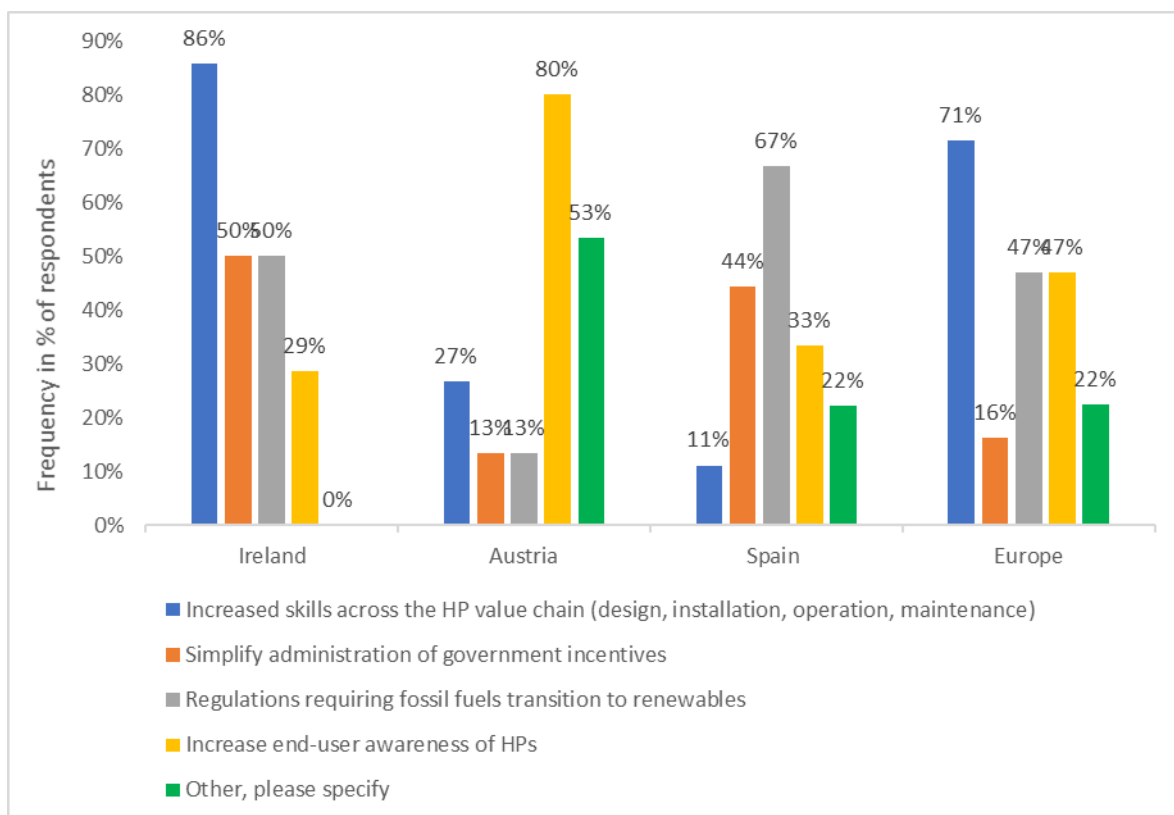


Figure 5: Comparison by country of the most important actions to scale the HP market



IRELAND

92% of survey respondents stated that increased skills across the HP value chain was one of the most important actions needed to scale up the HP market. The second most commonly chosen actions were simplifying administration of government incentives (46%), and regulations requiring fossil fuels transition to renewables (46%).

A reoccurring topic during the focus group was the need for policymakers to better communicate with the market, allowing experiences from the marketplace to play a role in developing policy going forward. Those working in the industry had the following observations.

- There have been problems relating to the administration of grant schemes for HPs, especially in terms of the high level of administrative work required for SME installers.
- A forum to provide feedback to policy making and policy updating would be useful to help to resolve some of the issues.
- Unregulated HP installations in new build could lead to poor performance and a backlash from the market. Further policy is needed to help solve this issue, and a decision should be taken on whether regulation would come from a national level or be industry led with support from national institutions.

The discussions of the focus group largely supported the results of the survey and with respect to future policy initiatives their recommendations focused on:

- Ensuring that new standards for HPs are properly implemented.
- Ensuring that installers are properly trained and that assessments of installations are carried out to check for quality and feedback any issues to the installer so that they can be corrected.
- Providing more training and information to consultancy firms that design heating systems to ensure that they are correctly designed and specified when they integrate HPs.
- Increasing the level of monitoring of HP installations so that effective measurement and verification of their performance can be carried out.
- Addressing the lack of knowledge among the general population on the basics of heat pumps and their potential benefits. Not every building is immediately suitable for a heat pump, but all buildings that are suitable for heat pumps should be targeted by advertising and other awareness campaigns.

AUSTRIA

Currently, the main challenges for the large-scale HP market are low levels of awareness of promising and economically feasible application possibilities among planners and users, and the lack of required skills by planners and installers. This indicates that future policies and initiatives would best focus on the incentives and awareness raising aspects of Upper Austria's policy approach. This could include, among others:

- training of actors along the value chain, particularly regarding planning and installation;
- significant information and awareness raising efforts for users and planners;
- market development funding and subsidies for feasibility studies to help overcome some of the early market barriers.

There are also many innovative topics to explore, (such as using HPs to feed into the district heating network, combining HPs with other renewables and energy efficiency measures, ice





storage, cold district heating) that could help identify interesting additional applications for large-scale HPs.

The discussion that took place during the focus group is consistent with the results of the survey. Increasing end-user awareness of HPs came out, by far, as the most important aspect for scaling up the HP market in Upper Austria. 12 out of 15 surveyed experts (80 %) agree on this. This is followed by the need to increase skills across the value chain. Aside from the pre-defined categories, the experts mentioned the need for better incentives that increase the economic feasibility of installing HP systems.

Regarding skill development in the HP market, the following aspects were mentioned:

- It is important to adopt a holistic approach and consider all actors along the value chain. HPs have interfaces to many areas of expertise. It is necessary to close these interfaces with knowledge.
- There is a large need for communication tools targeted to specific actor groups: case studies, best practices, information brochures, HP checklist for companies, information on planners and suppliers etc.
- More technical information on which HPs are already available as standard solutions for which application areas would be helpful. Experts seem to have different levels of knowledge about this.
- The "Energy Academy" of the ESV is a well-recognised and trusted training provider in Upper Austria. It is well-placed to offer training courses and technical site visits to a range of actors in the HP sector and plans to increase its offer on this topic.
- There is a need for awareness and communication activities aiming at increasing end-users' knowledge on HPs and where they can be used, as well as increasing the demand for certified HP planners and installers.

SPAIN

The majority of respondents in Spain (67%) selected "Regulations requiring fossils fuels transition to renewables" as the most important action to boost the HP market. The second most commonly selected action (44%) was "Simplify administration of government incentives". In the "other" category, the experts gave the following answers:

- Developing and improving the cost and performance of large equipment, ensuring that any performance improvements and system benefits are adequately disseminated to stakeholders in the value chain.
- Improve the available support programs and facilitate combined funding of multi-country actions for unique market uptake and early adoption initiatives.

In general, experts felt that much of the information that is currently available about HPs is ambiguous and there are few additional tools available that support the case for HPs as a replacement for fossil fuels, thus discouraging the sector from making the transition to HPs. Improved specification of the existing regulations that require the transition away from fossil fuels will bring greater clarity to the sector and accelerate the growth of the HP market. Additionally, it is important to simplify the rules around the administration of government incentives, especially in residential buildings to encourage uptake. Strengthening the detail





contained within energy audits and the provision of more concrete recommendations for both residential and non-residential buildings could also contribute to market developments.

Regarding skill development in the HP market, the following recommendations were made:

- It is urgent to standardise and clarify the regulations at sectoral, regional, and state level to avoid misinterpretation and misunderstanding of the rules. The clarification of regulations will allow a much faster development of the HP market in Spain.
- Raising awareness among manufacturers and installers of the shared use of air conditioning and heating systems to enable them to take advantage of the greater efficiencies that can be achieved through combined systems.
- It is important to show the added value of HPs compared to renewable energy technologies. For example, HP technology has achieved lower operating costs and longer equipment lifetimes but roll out has been hindered by the lack of incentives and the high price of electricity in Spain.
- Integration in the 4.0 dimensions: artificial intelligence, sensors and their adaptation with home automation, including connection with energy efficiency management software for buildings and industry, predictive maintenance and/or application of digital twin.

EHPA

A large majority of those surveyed (71%) selected “Increased skills across the HP value chain (design, installation, operation, maintenance)” as the most important action needed to scale up the heat pump market in their region. “Regulations requiring fossil fuels transition to renewables” and “Increase end-user awareness of HPs” were both selected as the second most important action. It is important to highlight that a significant number of those who selected “Other” as one of their options specified the need for subsidies to promote the use of renewables and renovation and the increasing taxes on CO₂ emissions.

Several of the recommendations given by the respondents focussed on the importance of raising awareness of the benefits of HPs at the different stages of the value chain. The most repeated recommendations related to skills development were the following:

- Focus on introducing HP technologies in the training and upskilling of installers and designers.
- Focus on building installation technicians and end-user competencies to properly choose, install, and manage HPs.
- Ensure it is possible for knowledge and know-how to be transferred from the HP industry to the fossil fuels industry.
- Take into account innovation in terms of HP interface to simplify the HP operation and installation process.
- Combine skills development with robust standards which are actively policed and enforced.





5 Conclusion

The specific actions that will have the most impact on boosting the HP market in each of the pilot regions will differ from each other since each country's market is at a different level of maturity and exists within its own policy framework. Despite the market differences, there are many common challenges and shared opinions between experts in different regions.

The results of this research suggest that actions for the increase of skills and competences all over the value chain should be taken for the development of the HP market, mainly focusing on the upskilling of installers and designers who might or might not be part of the HP industry. In order to stimulate the development of the HP market, those actions need a supportive policy framework that encourages the transition towards the use of renewable energy sources via, for example, taxation of CO₂, and a regulation of the built environment, for instance, banning fossil fuels in new buildings.

Financial incentives can also play a major role in the development of the HP market, as they are a key enabler for overcoming challenges such as the high cost of a heat pump installation and the high cost of electricity compared to the cost of fossil-fuel-powered systems like gas boilers. Working on raising awareness and making information available to all supply chain actors is considered of critical importance for the development of the HP market, particularly among end-users of HPs. Actions directed at raising awareness should become a priority in order to overcome the end-user's resistance to new technologies and encourage the demand for a transition away from fossil fuel-based systems.





6 Annex 1: Survey questions

HP4ALL information sheet

This research forms part of an EU – H2020 funded study led by Limerick Institute of Technology ('LIT'), Ireland. HP4All (HEAT PUMPS SKILLS FOR NZEB CONSTRUCTION) brings together leading experts across Europe to enable capacity and skills development within the Heat Pump sector and to ensure that the energy efficiency gains afforded by heat pumps are realised. The purpose of this survey is to understand the status of the HP market from the point of view of those currently working in it. The project is looking into the drivers and barriers that could stimulate or restrict the demand for skills in the European construction sector specifically related to HP system design, installation, commissioning, and ongoing maintenance. If you are happy to participate, please complete the following questions, which will look to gather insights into the barriers that prevent upskilling of the workforce and HP roll out around Europe.

You are being invited to take part in this study. Before you agree to do so, it is important that you understand the purpose and nature of the research and what if you agree, your participation will involve. Please read the following information carefully, and do ask if anything is not clear, or if you want more information. Contact details are given at the end of this information sheet.

Please rest assured that no personal information or contact details and IP addresses will be collected at any point, to ensure that your answers stay anonymous and cannot be traced back to you. You have the right to withdraw from the survey at any stage up to the point at which you click the submit button. At this point, your data will be collated with that of other participants and can no longer be retracted. If you wish to withdraw, simply close this form.

The anonymous data will primarily be stored on the Coordinators' MS Teams environment and will later be stored on the open-access repository ZENODO, which was developed under the European OpenAIRE program. It can be found at <https://zenodo.org/> and will be accessible to registered ZENODO users for 24 months. The information you provide may contribute to research reports, research publications and/or conference presentations delivered by the HP4ALL project team.

This study has obtained ethical approval from LIT Ethics Committee. If you have any queries about this research, you can contact the HP4ALL Project Coordinator at Seamus.Hoyne@lit.ie.

Instructions for setting up the online survey in orange

Section 1: Initial Profile

4. What is the MAIN activity of your organization? (select one answer)

- ☐ Research
- ☐ Manufacturer
- ☐ Planning/Designers/Distribution/Installation/Maintenance
- ☐ Energy Company
- ☐ Public Body
- ☐ Other (please specify) ...

5. Which of the following building types/heat pump scales do you normally work with? (Choose all that apply) (multiple choice)

- ☐ Residential



- Non-residential

Section 2: Drivers and barriers in the HP market

6. Select the **two most important** current drivers for HP Market Development in your country/region. (multiple choice)

- Supportive Policy Framework (e.g building regulations, standards etc)
- Financial Incentives
- Awareness Raising/Information Services
- Promotion by Energy Companies
- Other (please specify) ...

7. Select the **two most important** barriers for HP Market Development in your country/region. (multiple choice)

- Lack of qualified and experienced planners/designers/installers
- Low consumer awareness/resistance to new technologies
- High cost of installation/Lack of financial incentives
- Insufficient regulations requiring fossil fuels transition
- Other (please specify) ...

8. Are there any specific policies or regulations in place to support HP installation in your country which you think are important to mention? (select one answer)

- Yes (please specify) ...
- No
- Don't know

Section 3: Future Policies & Initiatives Needed

9. Select the two most important actions needed to dramatically scale up the HP market in your country/region? (multiple choice)

- Increased skills across the HP value chain (design, installation, operation, maintenance)
- Simplify administration of government incentives
- Regulations requiring fossil fuels transition to renewables
- Increase end-user awareness of HPs
- Other (please specify) ...

10. Select one from the following list which should be targeted for future upskilling initiatives (select one answer)

- Research
- Manufacturer
- Planning/Designers/Distribution/Installation/Maintenance
- Energy Company
- Public Body

11. Are there any further recommendations you would like to give us on skill development in the HP market? (please specify) ... (open ended question)

7 Annex 2: Ireland Country Report

Introduction

HP4ALL is a Horizon 2020 research and innovation project. Aims to enhance, develop, and promote the skills required for high quality, optimised HP installations within residential and non-residential buildings, bring Europe to the forefront of the climatization sector.

Key objectives:

- Design HP competency & excellence skills framework.
- Increase the number of skilled workers.
- Enable end users / clients to demand high quality solutions. This will be facilitated by the development of a HP knowledge hub.

An online survey was hosted on the online platform Survey Methods. Invites to take part in the survey were sent via email to a list of known Heat Pump Experts from Ireland across multiple disciplines. The survey was 'live' for 10 days, after which time the data from 14 completed surveys was exported from Survey Methods to excel and analysed.

Following the survey, a focus group was set up and attended by 6 HP Experts consisting of installers, suppliers, energy agency members, and manufacturers. The purpose of the focus group was to further explore the status of the Irish HP market by sharing experiences and observations.

In this report, the responses to the survey questions have been grouped into 3 sections with an accompanying description of the results with relevant inputs from the focus group meeting added to the appropriate section. The survey questions and tables showing the responses can be found in Appendix A.



Section 1: Participant Profile

This section of the report relates to questions 1 & 2 of the expert survey.

65% of respondents were in the planning/designing/distribution/installers/maintenance category. Energy (supply) Company members made up the second largest portion of respondents with 14%. Manufacturers, Research, and other categories comprised of 7% of respondents each. The response in the 'Other' category mentioned was Energy Agency. (See Figure 2 for details)

From the 14 surveys, 64% said that they worked in both the residential and non-residential HP sectors. With 22% only trading in the residential sector and 14% only trading in the non-residential sector. (See Figure 3 for details)

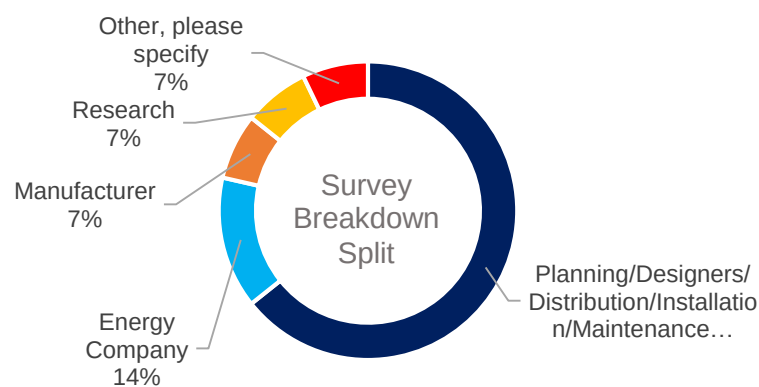


Figure 2 Question 1 Survey Split

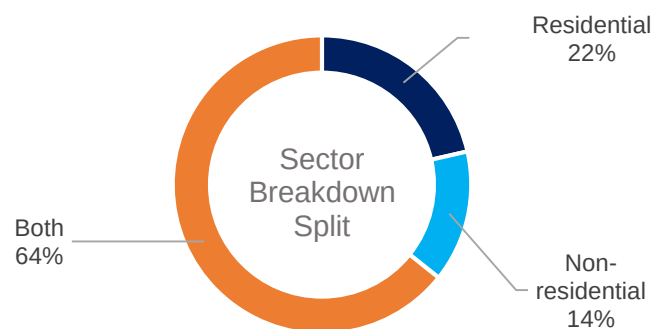


Figure 3 Question 2 Sector Split

A focus group meeting was held on February 3rd, 2021. Experts from different sectors of the HP market joined and voiced their opinions and experiences on the HP Market. The experts who participated in the focus group came from a HP manufacturer, design & sales agents, energy agency and an energy supply company. All 6 attendees worked in both residential and non-residential sector.

Section 2: Drivers, barriers & regulations in the HP market

This section of the report relates to questions 3, 4 & 5 of the expert survey.

Drivers in the HP market

The survey asked experts what, in their opinion, were the main drivers and the main barriers to HP installations in Ireland. 92% of participants thought that supportive policy framework was the main driver of the HP market. Promotion by Energy Companies was the second main driver at 38%. (See Figure 4 for details)

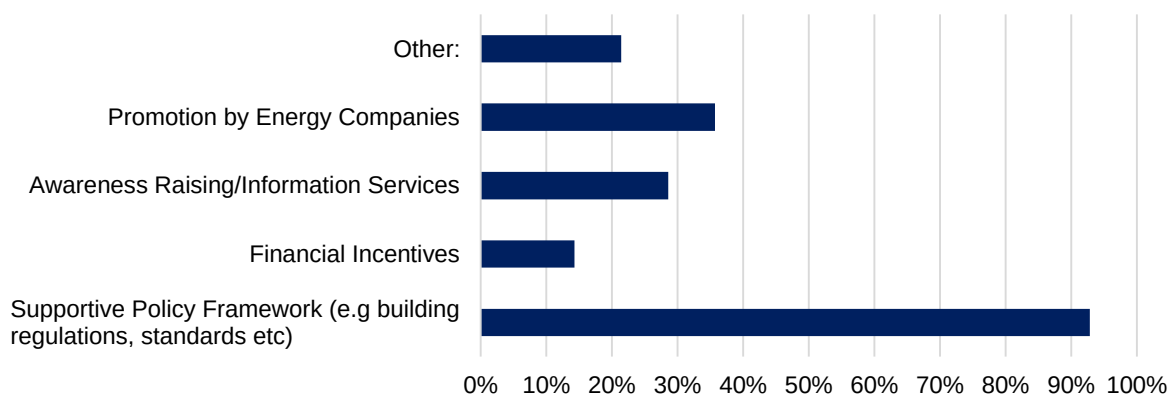


Figure 4 Question 3 Survey Results

During the focus group attendees were asked to comment on the survey results and share their personnel experiences. In this focus group discussion, it was agreed that context is very important and that we need to be aware of each sector of the HP market and look at drivers and barriers in relation to that sector (Residential, Non-residential, Retrofit, New Build) and who is doing the work as it will all depend on who is asked.

For New build, the main drivers were the new building regulations regarding NZEB (Near-Zero Energy Buildings) and the cost/benefit advantage of installing HPs instead of other renewable/sustainable technologies when meeting the requirements of the Building Regulations Part L.

For Retrofits, the main drivers mentioned were the heat pump grant, the SSRH scheme (Support Scheme for Renewable Heating) the Better Energy Community grant, campaigns by energy agencies, and housing standards.

Barriers in the HP market

Barriers to the HP market are limiting factors slowing down or halting HP installations in Ireland. From the survey 77% said that lack of qualified and experienced planners/designers/installers was the main barrier followed by insufficient regulations requiring transition from fossil fuels (46%). (See Figure 5 for details)

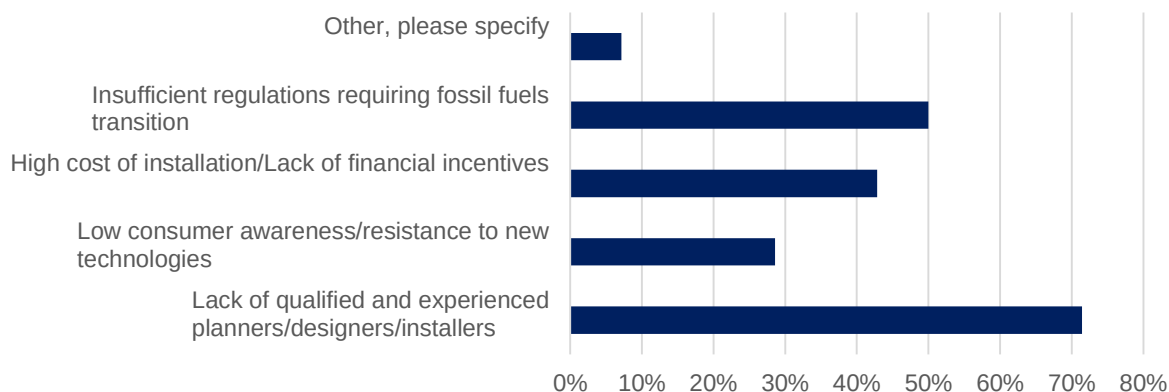


Figure 5 Question 4 Survey Results

Discussion of barriers made up the main portion of the focus group meeting. People operating in different sectors of the HP market had different issues to discuss regarding barriers to the uptake of greater numbers of HP installations.

There is a lack of a standardised approach to design and installation of domestic heat pump systems. For heat pumps installed under the domestic heat pump grant scheme, SEAI maintain a register of heat pump installers. Installers can gain inclusion on this register by having a level 6 plumbing qualification, completing an additional heat pump installer training module approved by QQI and by being certified by the agent for the heat pump they are installing that they have been trained on the installation and commissioning of that specific product. This SEAI register was seen as a good development, but it does not apply to heat pumps in new buildings. Also, the SEAI scheme excludes a number of very experienced installers, many with engineering or refrigeration or electrician qualifications.

Installations that are completed under this are subject to inspection by SEAI appointed assessor. This was seen as an important link in the chain as long as the process can maintain a consistent approach thus allowing installers to learn. However, in some cases it has been found that installers resent the input of the assessors, that if they fail an inspection, it might impact on their reputation.

Also in relation to the domestic heat pump grant, there was consensus among the group that the market place finds the administrative burden of the scheme to be a deterrent. They gave anecdotal evidence of prices to the end user being increased by installers to cover this admin burden and so eating into the benefit of the grant.

Other than general building control measures, heat pump installations in new builds are not specifically checked. The lack of standard procedures for HP installations or a national system for assessing the quality of this work was seen as a drawback. There was a concern that poor quality work would lead to underperforming systems which would cause serious damage to the heat pump market.

Inconsistencies in the approach to designing heating systems that include heat pumps was identified as another barrier to the HP market. This could stem from several issues such as installers not fully complying with the system design intent of the heat pump manufacturer,



potential for contradictions between manufacturer design intent and the requirements of building regulations and the use of cheaper with third party controllers, zoning and on/off controls that are reducing the efficiency of the HP and the effectiveness of the system.

Responsibility for the design of heating systems was also raised. Within the realms of the heat pump grant scheme, there is much discussion relating to who should take responsibility for the sizing of radiators for use in heat pump systems. While the same could be said for the sizing of the heat pump, the grant scheme requires that a Technical Assessment is carried out, typically by a BER assessor. This process is usually used to determine the size of the heat pump. However, it doesn't provide for the design of the heat emission system. In the case of underfloor heating the design is generally carried out by the equipment supplier but radiators have traditionally been sized by plumbers using a variety of methods ranging from detailed calculations to rough rules of thumb. With significant changes to building regulations in relation to heat loss in recent years, and the need for heat pumps to have very accurately sized radiators so as to ensure optimum performance, this area was seen by the group to be a major barrier and potential risk as the expected increased number of heat pump installations increases year on year.

It was however noted that NSAI are about to launch a new code of practice for the design and installation of heat pump systems and that this is a good first step.

Another barrier identified by the group was "building owner discomfort" i.e., building owners not having faith in the technology as opposed to any issues with their physiological comfort.

In relation to non-domestic heat pump systems, it was mentioned that some consulting engineers are not experienced in the detailed design of heat pump systems which can lead to heat pumps being installed incorrectly. This often stems from a lack of understanding of the requirements of the heat emission, distribution system and control requirements for optimum performance of low temperature heat pump systems.

An issue that affects residential and non-residential systems is the perceived difficulty in quickly addressing technical certification issues with DEAP. The example given was of non-domestic heat pumps coupled to domestic hot water (DHW) cylinders used to generate hot water for showers in leisure centers. For domestic systems, the combination of heat pump and DHW cylinders are provided by manufacturers as a package and as such the system comes with EN certification and so this is easily entered into DEAP. For more be-spoke systems, this "package" certification is not available and so the system cannot be entered in DEAP. This means the client cannot claim the potential energy/CO₂ savings that would result from them changing from oil or gas to a HP and so the project doesn't go ahead.

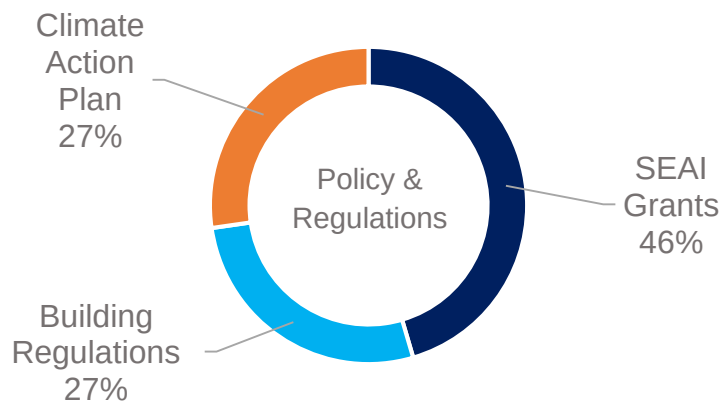
Regulations

Question 5 of the survey asked participants "Are there any specific policies or regulations in place to support HP installation in your country which you think are important to mention?". If the participants answered "Yes", then they were asked to please specify. Only 1 survey responded "No". The results from specified policies and regulations are summarized below:

1. Climate Action Plan. (27%)



2. SEAI Heat Pump Grant Scheme. (46%)
3. Building Regulations Part L (Dwellings & Non-Dwellings). (27%)



Focus Group:

In the focus group discussion, it was stated that, the National Standards Authority Ireland (NSAI) have a standard coming out in March/April, which will hopefully bring clarity to Design and installation requirements for commissioning HP.

In the focus group discussion, the domestic heat pump grant process was criticized as being arduous and cumbersome, particularly when there is a need to send in supporting documentation to justify design decisions inputted to the DEAP tool regarding system operating temperatures that differ from the defaults. The scheme requires that the building achieves a minimum heat loss indicator (HLI) value and members of the group felt that this can be difficult and expensive to achieve for many homes.

For non-domestic heat pumps, the SSRH scheme provides a capital grant of 30%. The members of the group thought that the numbers of installations resulting from this scheme were very low. Possible reasons for this were costs associated with getting the building “heat pump ready” and difficulty for DEAP in dealing with a wide range of bespoke equipment.

Section 3: Future Policies & Initiatives Needed

This section of the report relates to questions 6,7 & 8 of the expert survey.

Surveys were asked “Select the two most important actions needed to dramatically scale up the HP market in your country/region?” 92% of surveys stated that increased skills across the HP value chain was need, followed by simplifying administration of government incentives (46%), and regulations requiring fossil fuels transition to renewables (46%). Increase end-user awareness of HPs was the least picked answer with 31%. There were no other suggestions from the survey. (See Figure 6 for details)

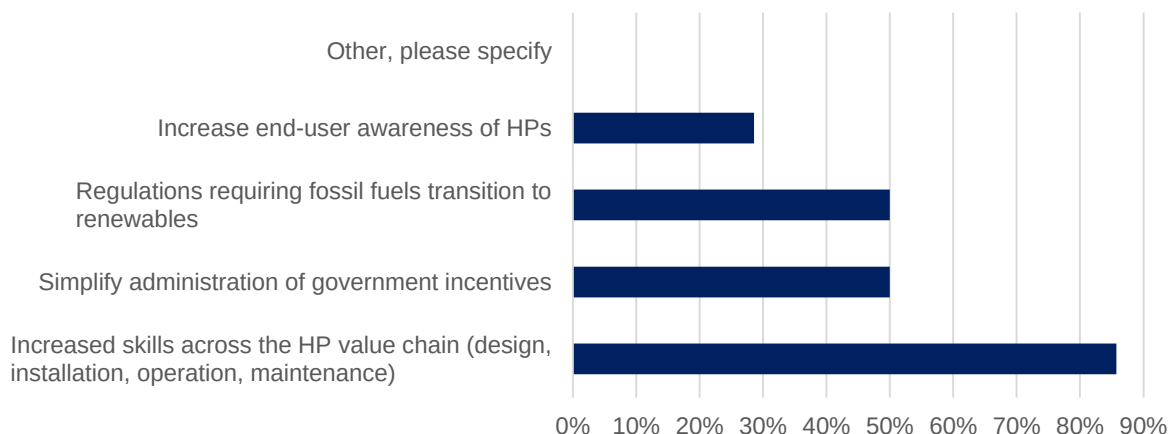


Figure 6 Question 6 Survey Results

A reoccurring topic during the focus group was the need for policymakers to better communicate with the market, allowing experiences from the marketplace to play a role in developing policy going forward.

Those working in the industry see the problems on the ground in real time.

- Problems relating to grant schemes, especially the high level administrative work required for one-man-band operations
- A forum could be provided to provide feedback to policy making and policy updating.
- Unregulated HP installations in new build could lead to poor performance and a backlash from the market. It was felt that policies could be developed to help solve this issue, whether regulation would come from a national level or be industry lead with support from national institutions.

The survey asked which sector of the HP market needs the most attention when it comes to upskilling. 79% of surveys said that Planning / distribution / installations / maintenance required upskilling to reach the Yearly HP installation targets. (See Figure 7 for details)

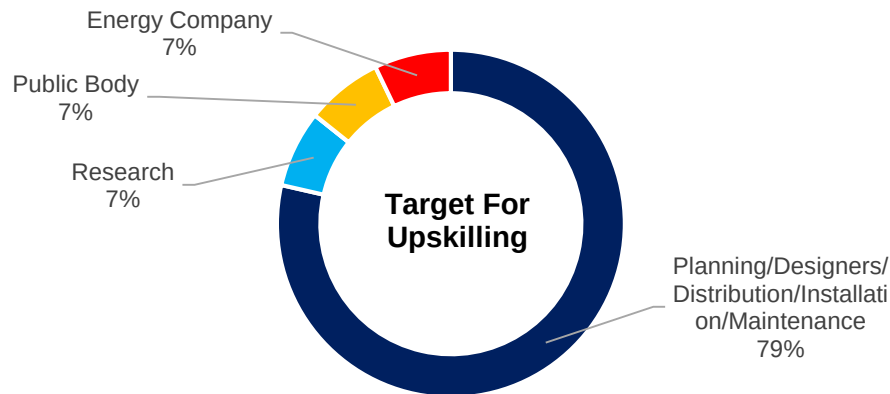


Figure 7 Question 7 Survey Results

From the focus group it discussion on future policy initiatives focused on:

- How to ensure the new NSAI standard is implemented.
- Installers need to be trained and assessment of installations needs to be done.
- Consultancy firms require more training and information for the design and integration of heat pump systems.
- The need for much more monitoring of heat pumps so that effective Monitoring and Verification of performance can be carried out.
- Within the general population there is a lack of knowledge on the basics of heat pumps and their potential benefits. Not every building is immediately suitable for a heat pump, but at the moment all buildings that are suitable for heat pumps should be targeted by advertising and other awareness campaigns.



Conclusion

Most of the survey participants were from planning, designing, installation and maintenance (64%) organisations, and work in both the Residential and Non-Residential sectors (64%).

93% of the group surveyed believed that Supportive Policy Framework (e.g., building regulations, standards etc) was the main driver in the uptake of heat pumps, mainly the fact that building regulations are causing the majority of new build dwellings to be fitted with heat pumps.

A significant output of the expert survey and focus group meeting was the consensus that there is a significant shortfall in the skills required to properly design, install, commission and maintain heating systems built around heat pumps and that this was acting as a barrier to market development. This barrier was selected by 71% of participants, an interesting result considering 64% of the participants work in this sector. This perceived shortage of the required skills was echoed in the responses to the survey question on areas that should be targeted for upskilling with 79% of response selecting this option.

From the focus group discussion, a prime example of this issue relates to the design of the heating emission and distribution system – applying the same rules of thumb that were applied for designing oil and gas fired systems to the design of heat pump systems will mean that systems are very inefficient and won't provide the comfort required, that the market will be damaged and that national CO₂ reductions will not be achieved. Yet, there are many installers fitting systems in 2021 who are not comfortable sizing radiators for use with heat pump systems. This is a major issue that needs to be addressed.

Lack of incentive for people to switch away from fossil fuel was the barrier chosen in second place by 50% of participants. Looking at regulations, 46% of participants were aware of the SEAI heat pump grant which is the sole measure in place to encourage owners of existing dwellings to switch from fossil fuel to heat pump. The focus group discussion provided insights of how this scheme is possibly not having a significant impact due mainly to the additional costs that may be required to get a dwelling to be heat pump ready.

In the survey, 29% of respondents said that increasing end-user awareness of HPs was required, but within the focus group meeting, the impression was that a far greater effort was required to get the general public excited about heat pumps and willing to look at all the value that is provided by a well-insulated house heated by a heat pump.

Barriers are also created by the systems implementing regulations, policy and supports. Examples were given where the heat pump grant schemes were sometimes seen as creating obstacles or where DEAP could not easily handle certain technical solutions if they are not off-the-shelf. There is a key role for equipment suppliers to discuss these issues with the administrators of these systems.



Appendix A - Survey Raw Results

Question 1

1. What is the MAIN activity of your organisation? (Select one answer)	Total	%
Planning/Designers/Distribution/Installation/Maintenance	9	64%
Energy Company	2	14%
Manufacturer	1	7%
Research	1	7%
Other, please specify	1	7%

Question 2

2. Which of the following building types/heat pump scales do you normally work with? (Choose all that apply)	Total	%
Residential	3	21%
Non-residential	2	14%
Both	9	64%

Question 3

3. Select the two most important current drivers for HP Market Development in your country/region	Total	Yes
Supportive Policy Framework (e.g., building regulations, standards etc)	13	93%
Financial Incentives	2	14%
Awareness Raising/Information Services	4	29%
Promotion by Energy Companies	5	36%
Other:	3	21%

Question 4

4. Select the two most important barriers for HP Market Development in your country/region.	Total	Yes
Lack of qualified and experienced planners/designers/installers	10	71%
Low consumer awareness/resistance to new technologies	4	29%
High cost of installation/Lack of financial incentives	6	43%
Insufficient regulations requiring fossil fuels transition	7	50%

Other, please specify	1	7%
Too many stupid regulations	1	7%

Question 5

5. Are there any specific policies or regulations in place to support HP installation in your country which you think are important to mention?	Total
Yes	13
No	0
Don't Know	1

If YES, please specify
Flopped grant system with far too many rules etc
Seai
Government Climate Action Plan
SEAI
-
Building Regulations & Climate Action Plan
Building Regulations Technical Guidance Document Part L - Conservation of Fuel and Energy - Building Other than Dwellings
-
Part L of building Regs - (Very Basic)
If YES, please specify
-
-
Building Regulations Part L (Dwellings & Non-Dwellings) & Climate Action Plan
SEAI grants etc

There is a grant available, but the process and paperwork are long and too complicated, requiring input from many different parties and is restricting uptake rather than improving it.

Question 6

6. Select the two most important actions needed to dramatically scale up the HP market in your country/region?	Total	%
Increased skills across the HP value chain (design, installation, operation, maintenance)	12	86%
Simplify administration of government incentives	7	50%
Regulations requiring fossil fuels transition to renewables	7	50%
Increase end-user awareness of HPs	4	29%
Other, please specify	0	0%

Question 7

7. Select one from the following list which should be targeted for future upskilling initiatives	Total	%
Planning/Designers/Distribution/Installation/Maintenance	11	79%
Research	1	7%
Manufacturer	0	0%
Public Body	1	7%
Energy Company	1	7%

Question 8

8. Are there any further recommendations you would like to give us on skill development in the HP market? (please specify)
Apprentices and colleges need to up skill the low levels of knowledge and understanding of heat pump design requirements amongst Building Services Engineers is low.
People should be made aware that geothermal is much better than air to water, and that life span is much greater
More training and upskilling required for installers to transition from boiler installation to HP proper installation.
..
Better awareness of how heat pumps should be installed so that they are not installed incorrectly. We frequently take out and refit existing heat pumps that were badly installed



1) A clear system of registration of HP installations in Ireland with subsequent MMV system to monitor performance should be established and the data from this used to better inform government and local authority policy making

2) Financial incentives schemes should be restructured to offer end users blended finance support through green loans, tax incentives and the use of grant minimised.

There is a large amount of unskilled heat pump designs in the market at present, especially in non-residential sector. Lack of detailed design, usually 'like for like' swap versus fossil fuel. No consideration for building fabric in relation to lower heat pump supply temperatures. No consideration for electrical loadings and COPs often overlooked. No ongoing monitoring of system operation and performance. Plug and play and walk away!!

An incentive should be put in place to deploy traditional installers of oil & gas systems, towards heat pump technology

Technology is not understood

Heat pump installations are underperforming due to lack of up-front design, specifically in the retrofit market.

Like for like swaps with fast response fossil fuel systems are common.

Skill development on designing the full system and not just the heat pump, sizing radiators, balancing & commissioning key for the heat pump to work efficiency, Also maintenance schedules etc.

Lack of awareness and incentive for implementation of heat pumps in industrial sector, including heat recovery of waste heat.

Critical that we establish deep credibility in the HP industry - this will be supported by developing and applying best practice guidance/standards across the value chain, this will most likely require oversight by relevant industry & professional bodies/stage agencies to ensure compliance.

The general public are not aware of or engaged with the idea of heat pumps - both marketing and consumer behaviour interaction is needed. There is also a skills gap in the end-to-end design/install/maintain of HPs.

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8 Annex 3: Upper Austria Country Report

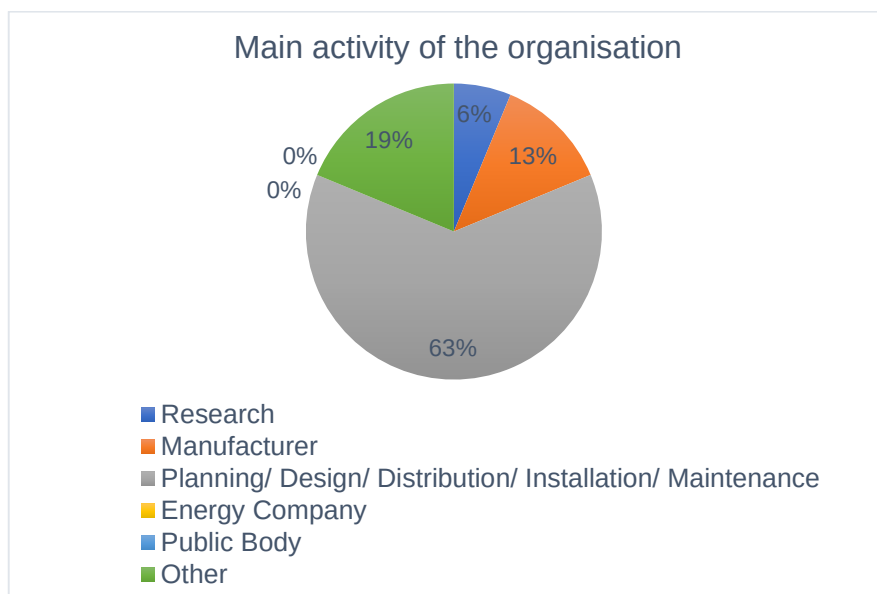
Introduction

In Upper Austria, a total of 20 HP experts were consulted. As first step, the survey was carried out through 15 structured bi-lateral interviews. These interviews provided the quantitative data presented in this report and contributed to identifying key topics for the focus group meeting. A 2-hour focus group was organised by the ESV and held on 26 January 2021 with 21 participants.

Participants represented key actor groups along the HP value chain, including suppliers and experts who are also users of heat pumps. The focus group allowed for in-depth exchange on the challenges and opportunities for HP market development in Upper Austria. Both in the survey and the focus group meeting, particular emphasis was put on larger scale HP applications (commercial and industrial), since developing this market is the main focus pursued in the HP4ALL project for the region of Upper Austria.

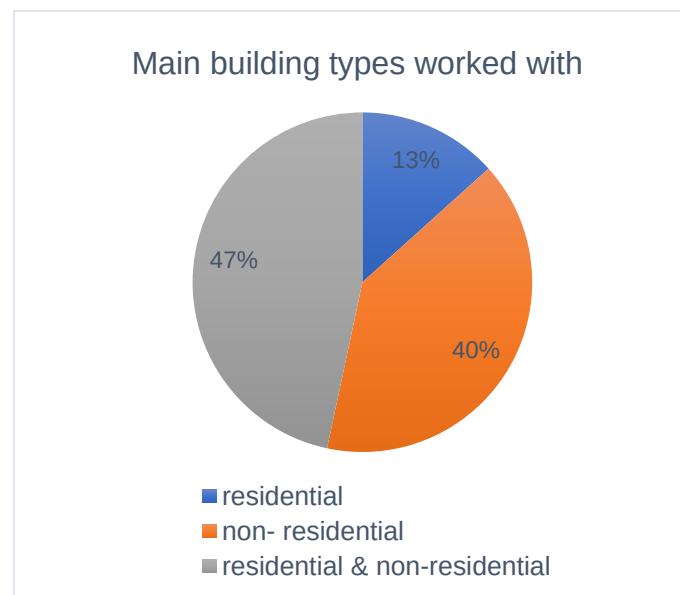
Section 1: Initial Profile

The surveyed professionals represent key actor groups along the HP value chain. The majority (63%) are active in the planning, designing, distribution, installation or maintenance of HPs. In Upper Austria, these activities are often carried out by the same company. 19 % are energy advisors (category "other"), 13% are manufacturers and 6% are researchers.



In Upper Austria, the heat pump market for small, residential applications is already quite well developed (especially in new builds). Therefore, it was decided to focus this survey on the opportunities and barriers to market development of large-scale applications in the service sector and industry. The ESV selected the respondents for the survey interviews according to this focus.

Around half of the surveyed professionals work with residential and non-residential buildings equally. 40 % focus predominantly on non-residential buildings and 13 % on residential buildings.



Section 2: Drivers and barriers in the HP market

Drivers in the HP market

Upper Austria has a well-established policy structure to tackle the energy transition. The multi-faceted approach is based on a combination of regulatory measures ("sticks"), financial incentives ("carrots") and information and training activities ("tambourines"). Together, these have supported the development of the HP sector so far. HPs are already a common solution for new buildings, both in the residential and non-residential sector.

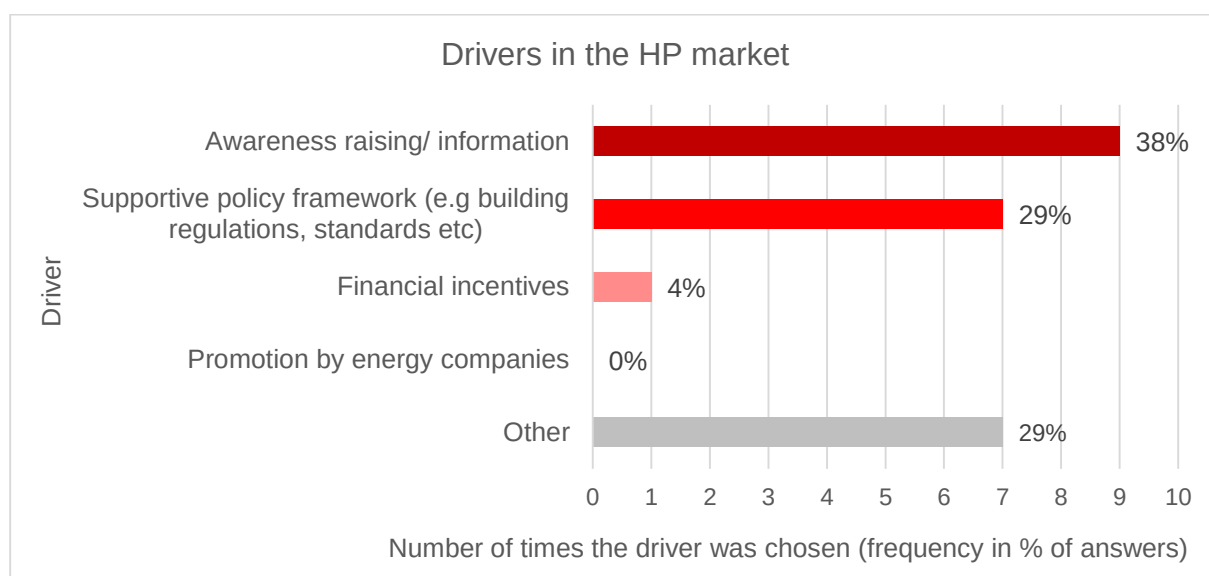
The regional government's decarbonisation target (which includes eliminating oil and gas heating) is seen as a key driver. The policy framework that is put in place to achieve these goals (ex: strict efficiency standards) supports the development and implementation of high efficiency and renewable solutions – including heat pumps.

Experts perceive the fact that HPs are already a favourable and interesting technology for new builds as an important market driver in itself. For new residential and commercial buildings,



they are often a suitable, relatively uncomplicated and economically feasible solution, especially when there is demand for both heating and cooling and flow temperature are low. The growing use of HPs contributes to increasing awareness about this technology, to companies gaining experience with it, and to customers enquiring ever more about further potential application areas. This is also influencing the field of large-scale HP, albeit still slowly.

The survey results are in line with the discussion that took place during the focus group. When asked about the main drivers for HP market development, "awareness raising and information" (and notably training services) and "supportive policy framework" (including financial incentives) were most frequently mentioned by the surveyed experts.



Barriers in the HP market

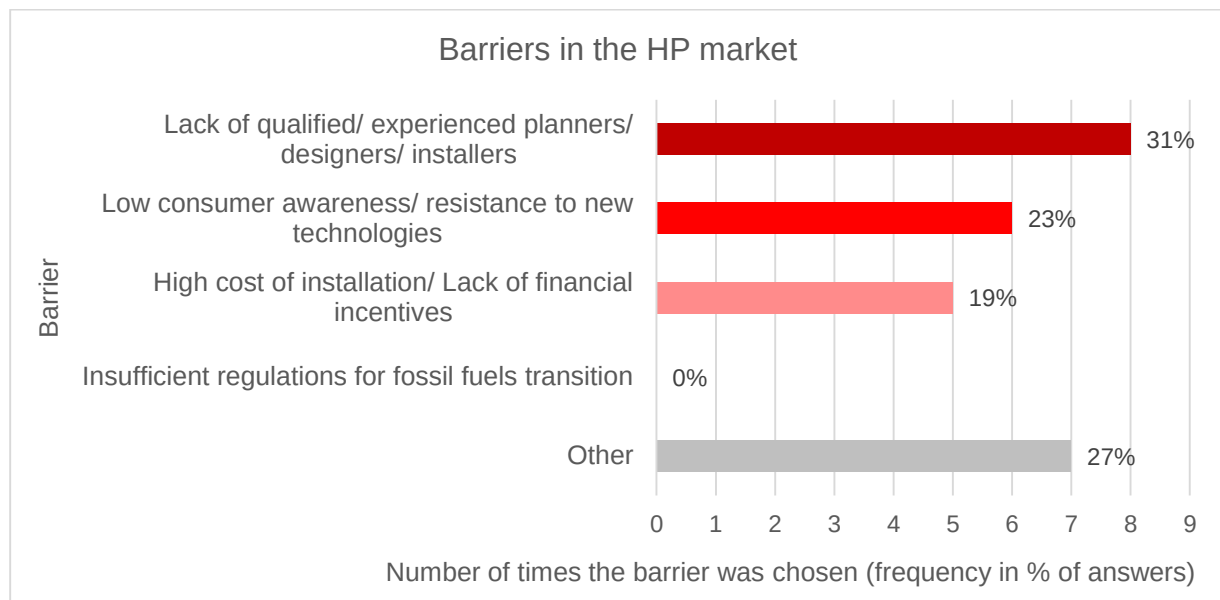
The large-scale HP market is still at a relatively early stage in Upper Austria and is faced with the related challenges. The most significant of these are low levels of awareness of promising and economically feasible application possibilities among planners and users, and the lack of required skills by planners and installers.

As with other energy transition technologies, investment costs present a challenge (especially compared to gas). In the case of large-scale HP solutions, economic efficiency is often more favourable when several sources (ex: groundwater, process waste heat) and sinks (i.e. application areas such as heating, hot water, air conditioning, cooling) are used, as well as when operating hours are high.

Experts agree that large-scale HPs have a high technical potential. At this stage, it is very important to raise awareness (of end-users as well as experts) on the range of application areas where HPs are already economically feasible. Also, good and qualified planning is

important. There are many interfaces between trades and specialists. More knowledge and knowhow are needed to close these.

The results of the survey confirm the discussion that took place in the focus group. In the survey, the experts mentioned the "lack of qualified and experienced planners/ designers and installers" as currently the largest challenge for market development. This was followed by the "low consumer awareness/ resistance to new technologies". Aside from the pre-given categories, a third of the experts mentioned the fact that HPs are often not suitable for the temperature needs for commercial and industry applications – and thereby the low efficiency of the HP system – as a barrier to HPs gaining further market share.



Regulations

The aforementioned policy package of the regional government ("Carrots, Sticks and Tambourines") has shown to be successful in Upper Austria for increasing energy efficiency and the use of renewables. It has positively contributed to the development of the HP sector so far.

The regional government's decarbonisation target (which includes eliminating oil and gas heating) is also positively seen by professionals in the HP sector. The measures put in place to achieve these goals (ex: strict efficiency standards) supports the development and implementation of high efficiency and renewable solutions.

Regarding HPs, strict efficiency criteria in funding programmes assure that only high-quality technologies are installed and that the further development of the HP sector contribute to energy efficiency and renewable goals.



Some experts expressed that fulfilling the criteria for large-scale HP applications can be challenging, thus prevent access to funding. It was also mentioned that subsidies for feasibility studies could be beneficial. Overall, 87% of the experts consider the current funding situation for HPs as mostly helpful for market development.

Section 3: Future Policies & Initiatives Needed

Currently, the main challenges for the large-scale HP market are low levels of awareness of promising and economically feasible application possibilities among planners and users, and the lack of required skills by planners and installers.

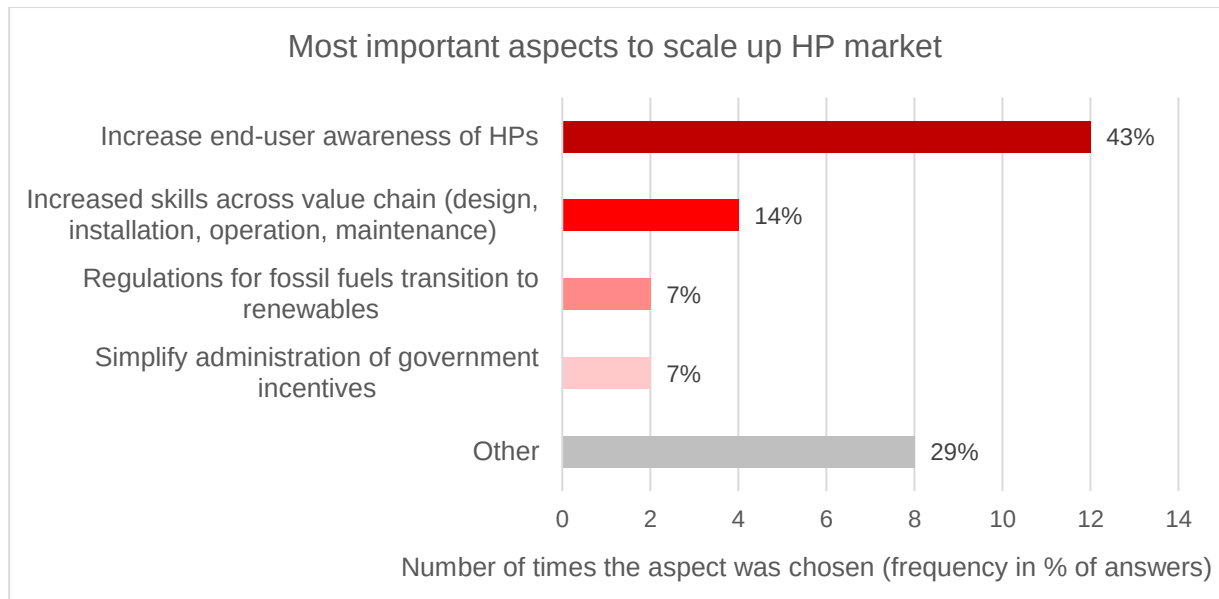
This indicates that future policies and initiatives would best focus on the "carrots" and "tambourines" aspects of Upper Austria's policy approach. This could include, among others:

- training of actors along the value chain, particularly regarding planning and installation;
- significant information and awareness raising efforts for users and planners;
- market development funding and subsidies for feasibility studies to help overcome some of the early market barriers.

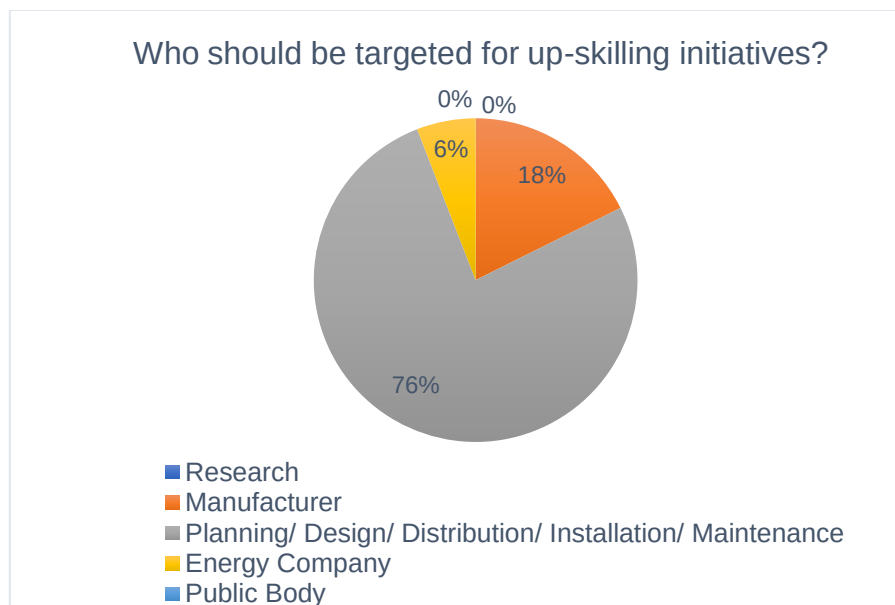
There are also many innovative topics to explore (ex: using HPs to feed into the district heating network, combination with other renewables and energy efficiency measures, ice storage, cold district heating) that could help identify interesting additional applications for large-scale HPs.

The discussion that took place during the focus group is consistent with the results of the survey. Increasing end-user awareness of HPs came out, by far, as the most important aspect for scaling up the HP market in Upper Austria. 12 out of 15 surveyed experts (80 %) agree on this. This is followed by the need to increase skills across the value chain. Aside from the pre-defined categories, the experts mentioned the need for better incentives that increase the economic feasibility of installing HP systems.





A large majority (76 %) of the consulted experts agree that up-skilling initiatives should target primarily people working hands-on in the planning, designing, distributing, installing and maintenance of HP systems. Around 20 % consider that training of manufacturers would also be beneficial.



Regarding skill development in the HP market, the following aspects were mentioned:

- It is important to adopt a holistic approach and consider all actors along the value chain. HPs have interfaces to many areas of expertise. It is necessary to close these interfaces with knowledge.



- There is a large need for communication tools targeted to specific actor groups: case studies, best practices, information brochures, HP checklist for companies, information on planners and suppliers etc.
- More technical information on which HPs are already available as standard solutions for which application areas would be helpful. Experts seem to have different levels of knowledge about this.
- The "Energy Academy" of the ESV is a well-recognised and trusted training provider in Upper Austria. It is well-placed to offer training courses and technical site visits to a range of actors in the HP sector and plans to increase its offer on this topic.
- There is a need for awareness and communication activities aiming at increasing end-users' knowledge on HPs and where they can be used, as well as increasing the demand for certified HP planners and installers.

Conclusion

The large-scale HP market is still at a relatively early stage in Upper Austria and is faced with the related challenges. These include especially low levels of awareness of promising application possibilities among planners and users, and the lack of required skills by planners and installers.

As with other energy transition technologies, investment costs present a challenge (especially compared to gas). In the case of large-scale HP solutions, economic efficiency is often more favourable when several sources (ex: groundwater, process waste heat) and sinks (i.e. application areas such as heating, hot water, air conditioning, cooling) are used, as well as when operating hours are high. Market development funding and subsidies for feasibility studies would help overcome some of the early-market barriers.

Experts agree that large-scale HPs have a high technical potential. At this stage, it is very important to raise awareness (of end-users as well as experts) on the range of application areas where HPs are already economically feasible. This will help get the market going.

Information, exchange and further training along the entire value chain (from professionals to end-users) is essential and would contribute to increasing awareness, generating end-user trust, creating both market push and demand and ensuring high-quality planning and implementation of projects.

Also, a range of innovative topics are worthwhile to be further explored, such as combining HPs with other renewables and energy efficiency measures, ice storage, district heating, etc. In the context of HP4ALL, market development activities in Upper Austria will take both standard applications as well as technology innovation into account.



9 Annex 4: Spain Country Report

Introduction

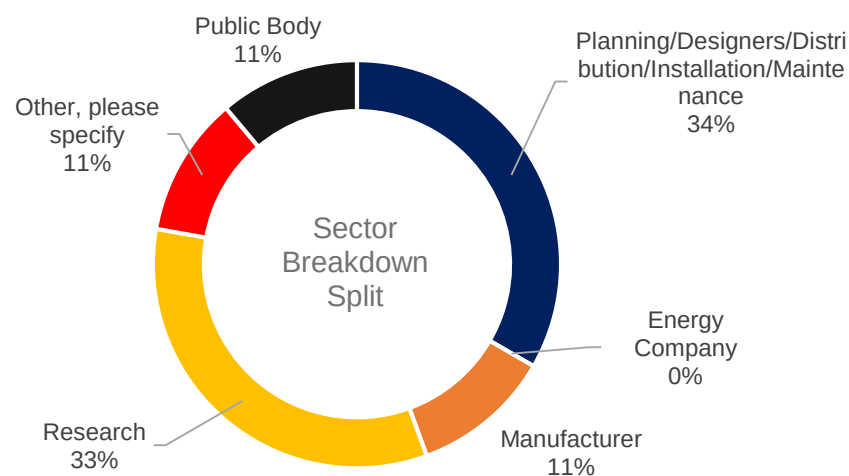
Due to COVID19 current situation, it was decided not to carry out the focus groups in Spain. It was difficult to bring together several companies on the same day and at the same time. Therefore, it was decided to interview the experts individually through online meetings as well as to discuss their answers in order to obtain further information.

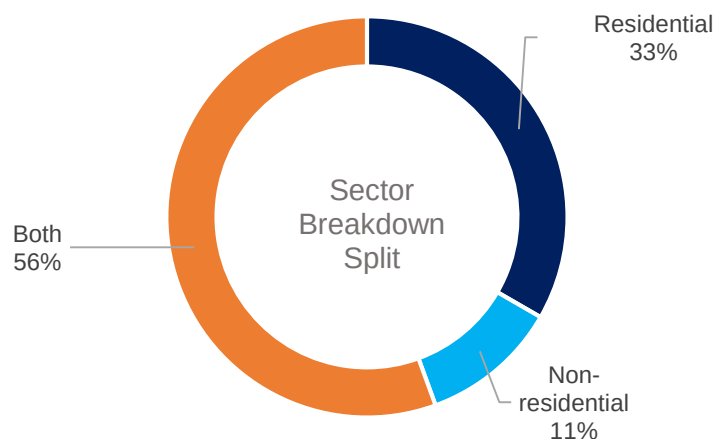
Finally, 9 Surveys were completed by the different HP experts throughout Spain across multiple disciplines through videoconference conversations. The discussions with the experts lasted between 30 - 40 minutes each one. During the meetings, enough information was gathered to draw relevant conclusions from the expert board.

Section 1: Initial Profile

34% of respondents were in the planning/designing/distribution/installers/maintenance category. Research made up the second largest portion of respondents with 33%. Public body, manufacturer, and other categories comprised of 11% of respondents each. The response in the 'Other' category mentioned was Utility/sales HVAC.

From the 9 surveys, 56% said that they worked in both the residential and non-residential HP sectors. With 33% only trading in the residential sector and 11% only trading in the non-residential sector mainly: public buildings, hospitals, sports centers, leisure and retail, and hotels.





Section 2: Drivers and barriers in the HP market

Drivers in the HP market

The key points were:

Regarding **supportive policy framework**

- Stronger regulation and certification is needed.
- An extension of the Regulation on Thermal Installations in Buildings (RITE) is necessary. It is not clear when it is considered renewable and when it is not.

Regarding **financial incentives**:

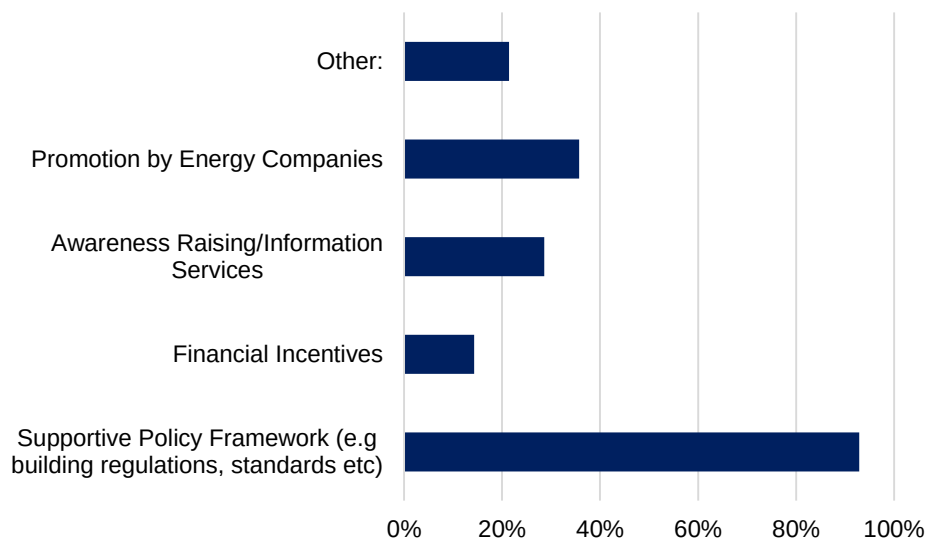
- It is not usually a problem if the design and installation of the building are modern. In older buildings it only makes sense if energy rehabilitation is also considered, as may be the case in small municipalities.
- It would be necessary to promote incentives similar to those for renewable energies.

Regarding **awareness raising/information services**:

- Necessary for both residential and non-residential users.
- Could be interesting if more competitively priced framework contracts are bundled. There is a lot of work to be done in this sense.

Responses	Total	%
Supportive Policy Framework	8	89%
Financial Incentives	6	67%
Awareness Raising/Information Services	4	44%

<i>Promotion by Energy Companies</i>	1	11%
<i>Other, please specify</i>	1	11%
TOTAL	20	100%



The two most frequent would be three answers (supportive policy framework, financial incentives and awareness raising/information services), as promotion by energy companies and “other” were chosen as answers the minimum number of times.

In “other” category the answers were: lack of availability of equipment giving 60°-70° degrees (two chained cycles).

Barriers in the HP market

The key points were:

Regarding **high cost of installation/lack of financial incentives**:

- This aspect in small municipalities or communities can be decisive for the implementation of HP in buildings.

Regarding **low consumer awareness/resistance to new technologies**:

- Especially among installers in non-residential buildings.
- Consumers are not aware of the main advantages of HP. This lack of knowledge makes end users and installers prefer to opt for technologies that are better known in maintenance and performance rather than HP technology.

Regarding **lack of qualified and experienced planners/designers/installers**, especially in building renovation and in new constructions.

Response	Total	%
<i>Lack of qualified and experienced planners/designers/installers</i>	2	22%
<i>Low consumer awareness/resistance to new technologies</i>	5	56%
<i>High cost of installation/Lack of financial incentives</i>	6	67%
<i>Insufficient regulations requiring fossil fuels transition</i>	4	44%
<i>Other, please specify</i>	3	33%
TOTAL	20	100%



High cost of installation/Lack of financial incentives was the most frequently chosen barrier. Followed by Insufficient regulations requiring fossil fuel transition and low consumer awareness/resistance to new technologies, as lack of qualified and experienced planners/designers/installers and “other” were chosen as answers the minimum number of times.

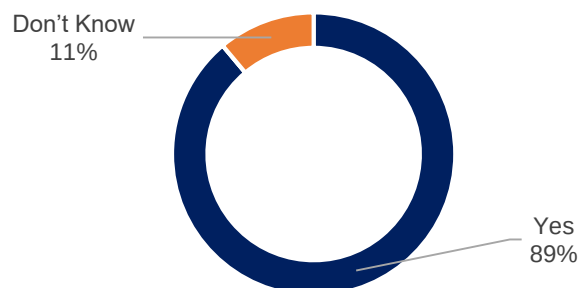
In “other” category the answers were: lack of clarity and homogeneity in regulations and thermal comfort and extreme temperatures.

Regulations

The key points were:

- The regulations best know are: Regulation on Thermal Installations in Buildings (RITE) and technical building code (CTE).
- RITE and CTE have many high efficiency technologies and are very favorable for heat pumps.
- RITE and CTE are very favorable but still need to be developed and specified in more specific individualized instructions for each use case.



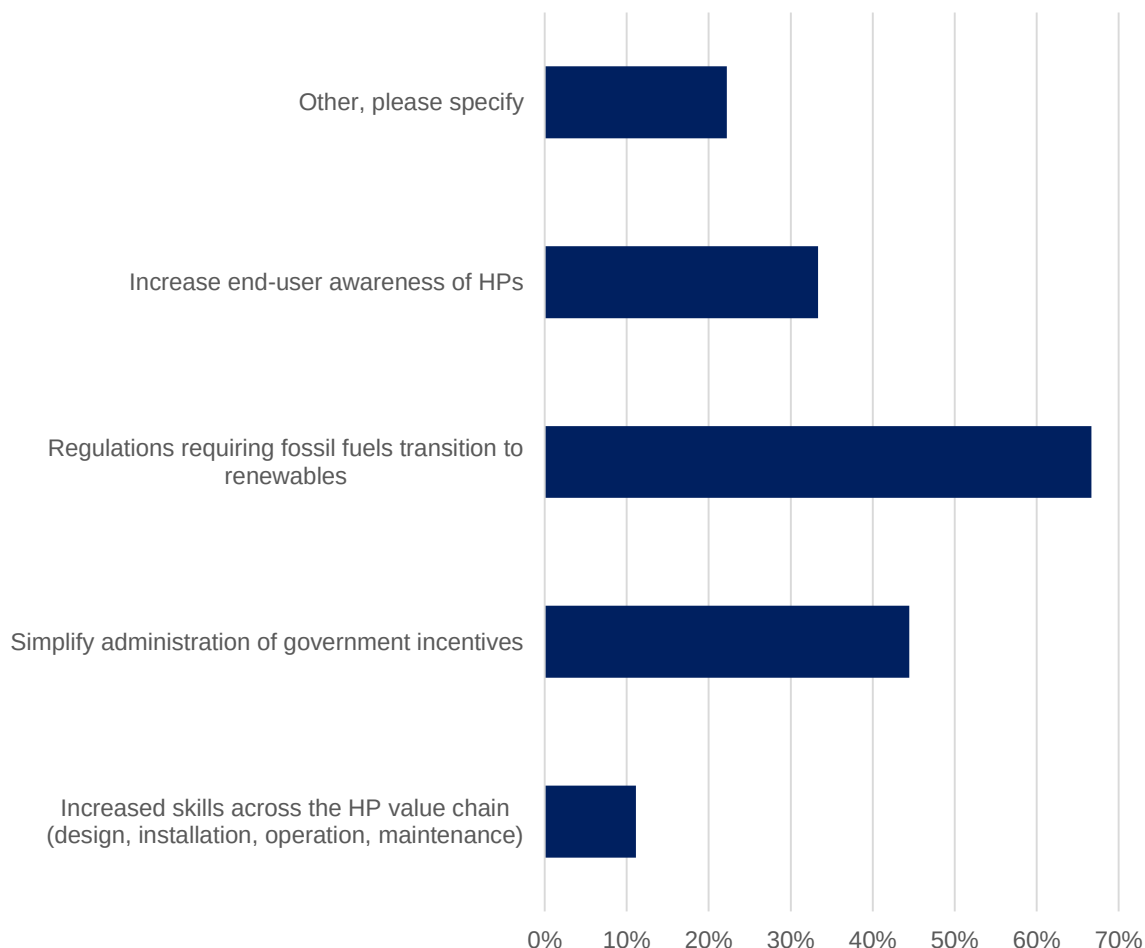


Section 3: Future Policies & Initiatives Needed

The key points were:

- Simplify administration of government incentives especially in residential buildings.
- Require more detailed energy audits and more concrete recommendations for both residential and non-residential buildings.
- There is a lot of ambiguous information and not enough tools to prove that heat pumps can replace renewable energies, thus discouraging the sector from making the transition to HP.
- Greater clarification and specification of existing regulations requiring the transition from fossil fuels to renewables.

Response	Total	%
<i>Increased skills across the HP value chain</i>	1	11%
<i>Simplify administration of government incentives</i>	4	44%
<i>Regulations requiring fossil fuels transition to renewables</i>	6	67%
<i>Increase end-user awareness of HPs</i>	3	33%
<i>Other, please specify</i>	2	22%
TOTAL	16	100%



Regulations requiring fossil fuels transition to renewables was the most frequently chosen barrier. Followed by increase end-user awareness of HPs and simplify administration of government incentives, as lack of increased skills across the HP value chain (design, installation, operation, maintenance) and “other” were chosen as answers the minimum number of times.

In “other” category the answers were:

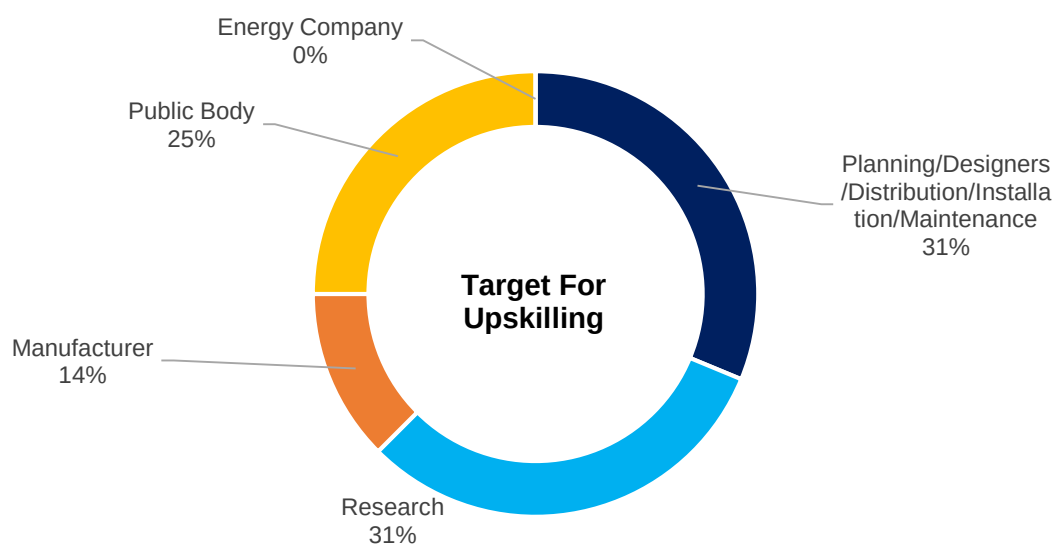
- Developing and improving the cost and performance of large equipment, ensuring performance and disseminating its benefits.
- Better endow support programs and facilitate combined funding of multi-country actions for unique/tractive market uptake/early adoption initiatives.

Future improvement initiatives

- In **research** to improve gases, oils and compressors. Increased performance of heat pumps. Integration with other renewable energies, use of waste heat and greater applications in industry.



- **Public body:** improve tools for calculating and justifying seasonal performance compared to renewable energies. Improve regulation and promotion of self-consumption. Promote actions to disseminate regulations and communicate the advantages of HP.
- In **manufacturing** to improve the type of refrigerant and reduce the manufacturing costs.
- Improve the design of the final **installations**. If the installations are not adequate, the advantages of installing heat pumps are not appreciated. Lack of support tools (early adoption, market uptake, renovation wave).



List the top most frequently recurring recommendations.

- It is urgent to homogenize and clarify the regulations at sectoral, regional and state level to avoid individual interpretations. The clarification of regulations will allow a much faster deployment of HP market in Spain.
- Raise awareness among manufacturers and installers of the shared use of air conditioning and heating to take advantage of heat and cold (greater efficiency).
- It should be possible to classify and qualify the equipment and the dwellings energetically in (kwh/m²year), the amortization of the heat pumps is very fast and should be visualized.
- It is important to show the added value of heat pumps compared to renewable energies: HP technology has achieved lower operating costs and longer equipment lifetimes. Its implementation has been displaced due to the lack of initiatives and the high price of electricity in Spain.
- Integration in the 4.0 paradigm: artificial intelligence, sensors and their adaptation with home automation, including connection with energy efficiency management



software for buildings and industry, predictive maintenance and/or application of digital twin.

Conclusion

Despite the current maturity of HP technology, it is still expensive in terms of acquisition, operation and maintenance costs, especially in less favourable climatic zones. It is important to reduce costs and combine with renewable energy generation (only in self-consumption so that it is not competitive with natural gas). Industrial heat pumps have a long way to go to improve their efficiency. In residential buildings, it is important to reduce installation, operation and maintenance costs.

There is unclear regulatory information that must be homogenized and specified to avoid individual misunderstandings among the different parties. Clarifying and unifying the regulations will allow a greater deployment and implementation of heat pumps in Spain.

On the other hand, it is important to promote hybrid applications: combination with other renewable energies and utilization of waste heat to improve energy efficiency.

Answers
Sensitize manufacturers and installers, especially in tertiary, in the shared use with DHW and heating. In refrigeration a lot of heat is thrown away, which in tertiary would be very interesting to take advantage of, even small machines could work simultaneously (thermo-cooling-pumps).
It is urgent to standardize and clarify the various regulations, sectorally (especially for applications for DHW) and at different levels of action (regional, state ...); it is not thought of, understood or well known all the possible casuistry, which should be more studied, resolved and protocolized to avoid having to give rise to individual interpretations of the authorizing and that generate fears and doubts, leading to delays and changes to safer but less efficient approaches. The administration should clarify the terms of interpretation of the regulations -very favorable on the other hand with the specifications H4 and 5 of the Basic Document HE of the CTE- so that the professional designers and installers have a certain framework of action and the Administration itself can make decisions with greater security in permits and authorizations, eliminating the current delays, obstacles and doubts when facing the installation files. The technology is known and sufficiently developed.
The problem is not the end user, he trusts the professional installers and they know well the technological offer, they are the ones who should have a clearer framework for action.
There are interesting developments ahead (integration with other RES-E and new refrigerants) but the market is sufficiently mature and the technologies are sufficiently competitive and inexpensive in price (even compared to other renewable technologies such as solar thermal for DHW) for a much faster deployment if the regulations and their interpretation are clarified.
The technology is already at the limit, it is not necessary to exceed 100°. Energy rating/qualification of equipment and houses (kwh/m2year) quantified, amortization is very fast and must be visualized
It is a technology that has been known for a long time and has achieved long operating costs and equipment lifetime. Its lack of implementation has been displaced by the ease of implementation of other technologies/fuels and the fact that the technological cost is not cheap compared to its useful life, together with the fact that there have been no energy planning initiatives and high electricity prices.





I believe that the manufacturers sell it as having high performance in operating conditions that do not correspond to the real SCOP of the facilities. This means that they are sold with benefits that are not true. It is true that SCOP of 3 are already good but, for this reason, it is necessary to tell the reality and put on the table other initiatives that determine the technology.

To be able to displace other options it is necessary to reduce the cost of equipment.

Its limitations to reach high water heating temperatures is also a problem and forces to incur extra costs in installations.

Much progress has been made in performance and refrigerants. It has to continue advancing along this path in order to reach temperatures of water heating levado.

Currently this the CO₂ as a refrigerant that reaches high water heating temperatures, however, is the technological uncertainty of how long will be the life of the equipment as it is a delicate and expensive technology.

Search for EE but also added value (integration with EERR, prosumers, air quality, new indoor construction with very high air quality, ensure ventilation).

Despite its maturity and robustness, it is still comparatively expensive due to its acquisition, operation and maintenance costs -especially in less favorable climatic zones-, it is important to reduce costs and combine it with RES-E generation (but for self-consumption, otherwise it is not competitive with natural gas). Waste heat and application for domestic hot water is wasted.

It is important to launch and disseminate pilot projects, give visibility to the technology, but with clarity and realism, starting with what can be achieved today, and encourage installers and users to adopt these technologies in cases where the current technology is viable, without creating false expectations. This will also encourage the market to develop better equipment.

Trends observed in business R&D&I (CDTI projects approved in the last 10 years): This is a relatively mature technology, but still has a long way to go. R&D&I has been initially focused on the development of the heat pump itself (physicochemical processes and design and production processes of the equipment and its components) and later on its adaptation to different climatic conditions or the use of refrigerants with low environmental impact. The latest trends in this technology are:

- Improved efficiency of equipment and its impact on the life cycle.
- Optimal scaling (semi-industrial equipment has a wide range of efficiency improvements).
- Residential (single-family or new multi-family construction): Higher DHW temperatures by integrating solar thermal and geothermal, and reduced installation, operation and maintenance costs.
- Hybrid applications (combination with other RES-E), and utilization of waste heat.
- Other uses (heat and hot water): household appliances (high-end dryers, dishwashers, etc.). Their cost is higher, but they achieve higher efficiencies.
- Integration in the 4.0 paradigm (AI, sensors and advanced adaptive controls for integration in home automation or industrial environments), including connection and coordinated management with energy efficiency management software for buildings and industry, predictive maintenance and/or digital twin application.





10 Annex 5: Europe-wide report from EHPA

Introduction

EHPA carried out an online survey which was disseminated on EHPA's social media channels as well as EHPA's members and external mailing lists.

The survey received a total of 59 replies, however, only 49 participants completed entirely the survey.

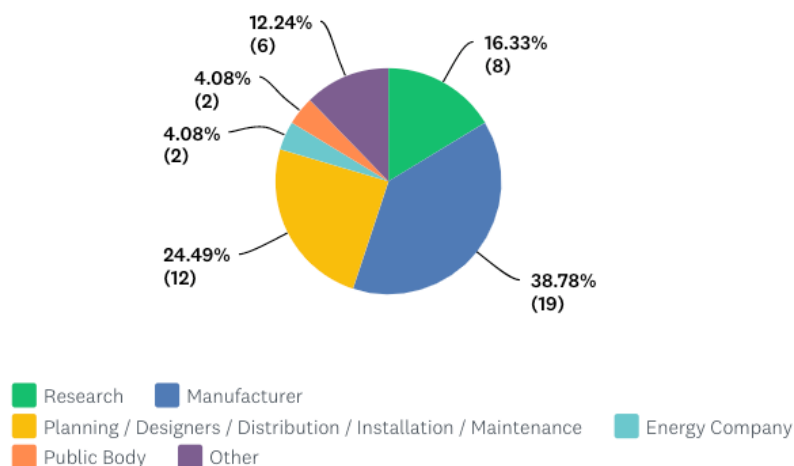
Section 1: Initial Profile

Almost 40% of the respondents were part of manufacturing companies (38.78%), followed closely by participants on Planning / Designers / Distribution / Installation / Maintenance organizations (24.49%) and respondents coming from research bodies (16.33%). Around 8% of the participants labeled themselves as consultants. A less significant number of participants were part of Energy companies and public bodies (4.08% each).

The large majority of respondents (79.59%) worked on Residential building types/heat pump scales, however, a significant number also worked with Non-residential (48.98%).

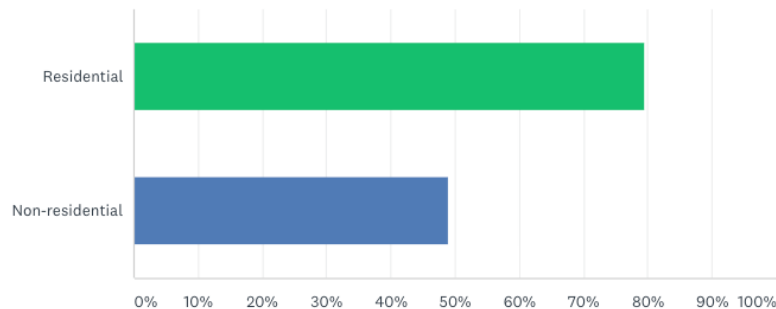
What is the MAIN activity of your organization?

Answered: 49 Skipped: 0



Which of the following building types/heat pump scales do you normally work with?

Answered: 49 Skipped: 0

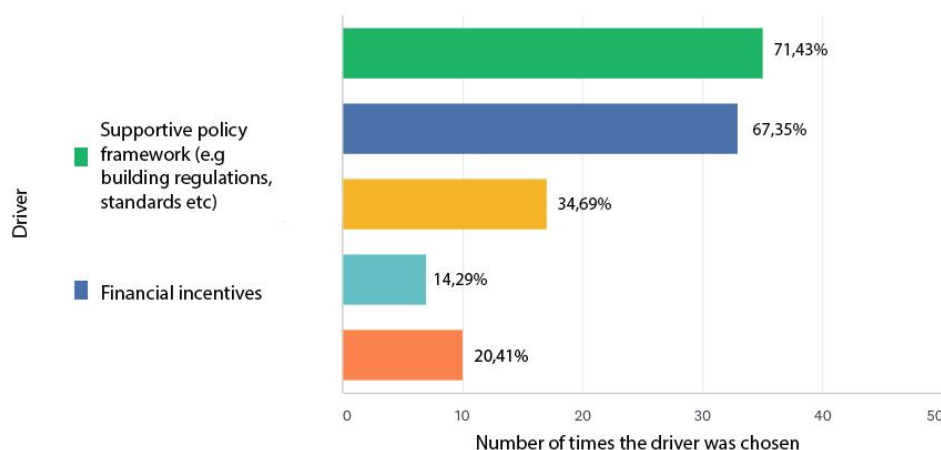


Section 2: Drivers and barriers in the HP market

Drivers in the HP market

	Answers	Frequency
Supportive Policy Framework	35	71.43%
Financial Incentives	33	67.35%
Awareness Raising	17	34.69%
Promotion	7	14.29%
Other (please specify) ...	10	20.41%

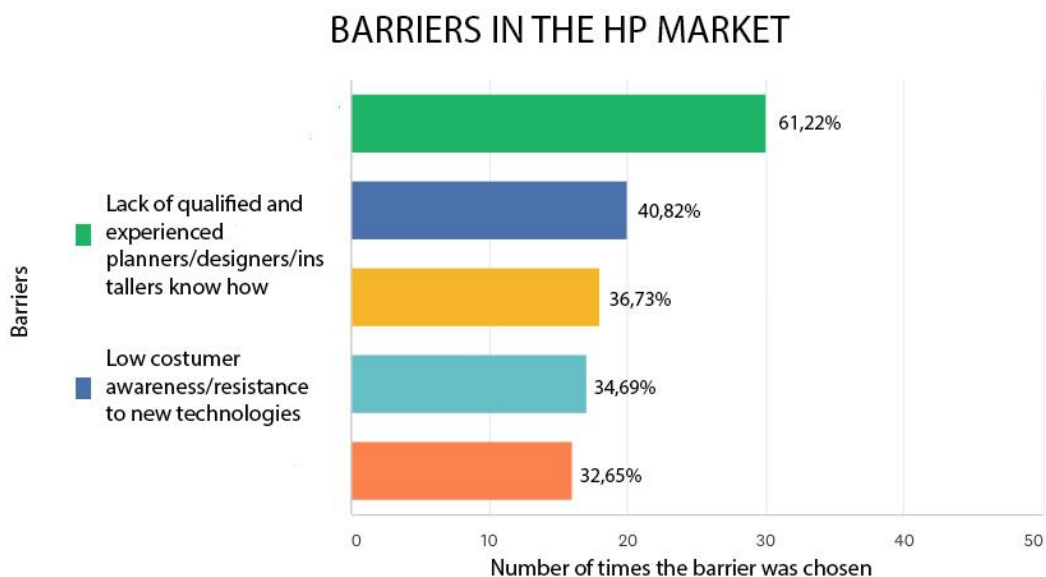
DRIVERS IN THE HP MARKET



A large majority of respondents considered supportive policy framework (71.43%) and financial incentives (67.35%) as the two most important current drivers for the heat pump market development. However, around the third of the participants also mentioned the importance of awareness raising (34.69%). A significant number of the participants that chose the Other category expressed that design, or more concretely, the training on design and installation are the most important drivers at this point in time.

Barriers in the HP market

	Answers	Frequency
Lack of qualified and experienced planners/designers/installers know how	30	61.22%
Low awareness/resistance to new technologies	20	40.82%
High cost of installation/lack of financial incentives	17	34.69%
Insufficient regulations requiring fossil fuels transition	18	36.73%
Other (please specify) ...	16	32.65%



The most frequent option chosen by the participants was the Lack of qualified and experienced planners/designers/installers know how (61.22%). The second most frequent option was the low costumer awareness and the resistance to new technologies (40.82%). It is important to highlight that the other options available were only slightly less frequent than the second option.

It is remarkable that a significant part of the respondents that chose the Other option mentioned the high electricity costs in comparison with gas costs as the main current barrier for the heat pump market.

Regulations

More than half of the participants (59.18%) specified that there were policies and regulations in place to support HP installation in their countries.

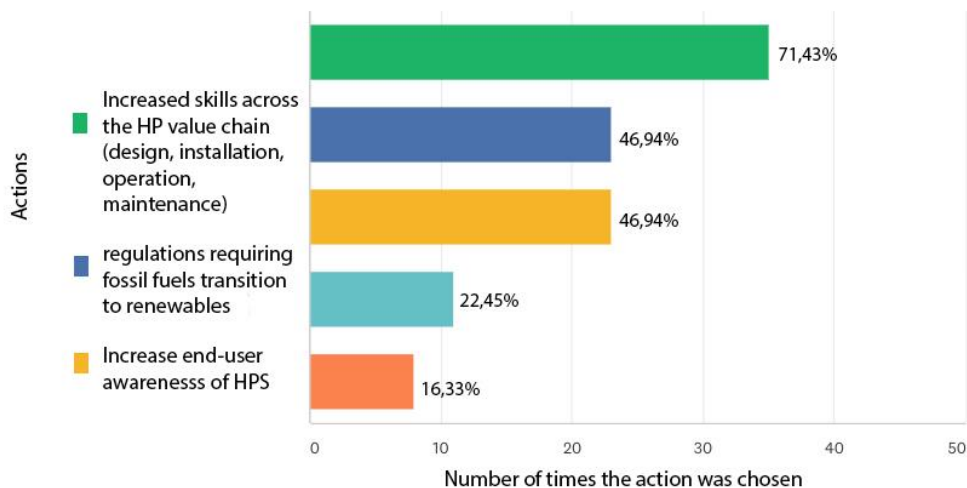
The 29 responses can be distributed in the 6 different groups below:

- **Subsidies:** such incentives for reducing GHG Emissions, increase efficiency, use of renewable energy sources or HP installation.
- **Tax deduction** on Heat Pump installation
- **CO₂ Tax**
- **White certificates:** such as the Certificate d'Economie d'Energie (CEE) in France
- **Building regulations:** such as the obligation to use up to 50% of renewable energies in new buildings technological systems and banning fossil fuels in new homes

Section 3: Future Policies & Initiatives Needed

	Answers	Frequency
Increased skills across the HP value chain (design, installation, operation, maintenance)	35	71.43%
Regulations requiring fossil fuels transition to renewables	23	46.94%
Increase end-user awareness of HPs	23	46.94%
Other (please specify)	11	22.45%
Simplify administration of governments incentives	8	16.33%

ACTIONS TO SCALE UP THE HP MARKET



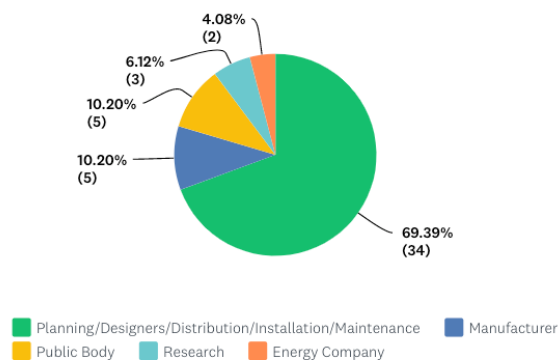
A large majority of those surveyed (71.43%) selected Increased skills across the HP value chain (design, installation, operation, maintenance) as the most important action needed to scale up the heat pump market in their region.

Both regulations requiring fossil fuels transition to renewables and Increase end-user awareness of HPS were selected as the second most important action.

It is important to highlight that a significant number of those who selected Other as one of their options specified the need for subsidies to promote the use of renewables and renovation and the increase on Tax for CO₂.

Select one from the following list which should be targeted for future upskilling initiatives

Answered: 49 Skipped: 0





The majority of the surveyed considered that the main target for future upskilling initiatives should be those involved in Planning/designers/distribution/installation/maintenance activities. 10.20% of the participants considered that the upskilling initiatives should focus on Manufacturers; 10.20% also highlighted Public Bodies as the ones to target, meanwhile only 6.12% considered important to first focus on Research.

Despite the nature of the question, several of the recommendations given by the surveyed placed their focus on the importance of raising awareness on the benefits of heat pumps at the different stages of the value chain. The most repeated recommendations related to skill development were the following:

- Focus on introducing HP technologies on the training and upskilling of installers and designers
- Focus on building installation technicians and end-user competencies to properly choose, install and manage HPs
- Make possible the transferring of know-how from the HP industry to the fossil fuels industry.
- Take into account innovation in terms of heat pump interface to simplify HPs operation and installation process.
- Combine skill development with robust standards which are actively policed and enforced.

Conclusion

The results of this research suggest that actions for the increase of skills and competences all over the value chain should be taken for the development of the HP market, mainly focusing on the upskilling of installers and designers who might or might not be part of the HP industry.

Nevertheless, in order to stimulate the development of the HP market, those actions need of a supportive policy framework that encourages the transition towards the use of renewable energy sources via, for example, taxation of CO₂, and a regulation of the built environment, for instance, banning fossil fuels in new buildings.

Financial incentives can also play a major role on the development of the HP market, as they are a key enabler for overcoming challenges such as the high cost of a heat pump installation and the high cost of electricity compared to the cost of fossil-fuel-powered systems like gas boilers.

Working on raising awareness and information available is considered as a driver to carry out for the development of the HP market, as well as a significant number of recommendations given by the surveyed highlighted the importance of end-user's awareness on heat pumps. Actions directed to raising awareness should become a priority in order to overcome the end-user's resistance to new technologies and encourage this way the demand of a fossil-fuel-free transition.

