H2020-LC-SC3-EE-2019

HEAT PUMPS SKILLS FOR NZEB CONSTRUCTION (HP4ALL)

D6.1 - HP4ALL REPLICATION PLAN

Lead Partner: FCTA- Fundación Corporación Tecnológica de Andalucía

Author: Carlos García

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Contact persons	Padraic O'Reilly (**padraic.oreilly@tus.ie**); Stephen Murphy (**Stephen.Murphy@tus.ie**)		
Website	**http://www.hp4all.eu**		

Report Contributors				
	Name	Organisation	Role / Title	**E-mail**
Report leader	Carlos García	FCTA	Head of Sector Building and construction	carlos.garcia @corporaciontecnologica.com
Contributing Author(s)				
Reviewer(s)	Padraic O'Reilly	TUS	Research fellow	padraic.oreilly@tus.ie
	Stephen Murphy	TUS	Research fellow	stephen.Murphy@tus.ie
Final review and quality approval	Stephen Murphy	TUS	Research fellow	stephen.Murphy@tus.ie

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Executive summary

Against the backdrop of the hardships and global energy market disruption caused by Russia's invasion of Ukraine and in order to curb the climate crisis, the EC presented on the 18th May 2022 the REPowerEU (RPEU) Plan Communication, a comprehensive package of measures to address massive *energy savings*, wide diversification of *energy supplies*, and accelerated roll-out of *renewable energy* in households, industry and power generation, particularly HPs[1].

The ambitious objectives set forth by the RPEU Plan mean that by 2030 that the number of HP related workers in the EU (manufacturing, installation, maintenance) be increased by 50%, and that out of the existing workers, at least 50% will also need to be reskilled to work with HP technologies (electric, hybrid, thermal). This is an enormous challenge as HP installation requires twice as much time as boilers, according to the European Heating Industry (EHI).

For this reason, the RPEU initiative deserves particular attention to establish a *Large-scale Skills Partnership* to maintain and regain technological and industrial leadership in key areas and to support the workforce.

In this context the HP4All project aims to enable the framework and guidance for a massive capacity and skills development within the Heat Pump (HP) sector following a holistic, approach involving both the supply side (manufacturers, SMEs, installers etc) and demand side (building owners, public sector etc.).

To this end HP4ALL has developed a set of tools and resources to be adapted and replicated EU-wide -the so called **HP4ALL package**-:

-A **HP Competency Framework** to facilitate Mutual Recognition of HP Skills

-A user-oriented **HP Knowledge Hub** (e.g., technical information, case studies, procurement guidance etc.) to help out stakeholders decision making throughout the whole value chain, in particular in its lower end (designers, installers, consumers)

-An **HP Benchmarking Tool** to optimize the HP acquisition decision making process

- **Awareness Campaign materials** to assist in the EU-wide roll out of heat pumps and the replication of the HP4ALL project success.

With a view to ensuring its widest adoption at EU scale the HP4All package has been validated, in three countries/regions with varying stakeholders and scenarios: **Upper Austria, Andalusia, and Ireland**. The first stage of the Replication Plan includes its testing and validation within **Observer Countries** (HR, PT, RO), acting as early adopters thereof.

The present **Replication Plan** includes detailed provisions and guidelines to optimise the replication pathways of the HP4ALL package and its related, underpinning, policy recommendations.

[1] Doubling of the rate of deployment of heat pumps over the next 5 years resulting in a cumulative ten million units

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Acronyms and abbreviations

EC	European Commission
EE	Energy Efficiency
EHI	European Heating Industry
EED	Energy Efficiency Directive
EPBD	Energy Performance of Buildings Directive
ESIF	European Structural and Investment Funds
ESF	European Social Fund
EU	European Union
HP	Heat Pump
MEPS	Minimum Energy Performance Standards
MFF	Multiannual Financial Framework
MS	Member States
OSS	One-Stop-Shop
RED	Renewable Energy Directive
RES	Renewable Energies
RPEU	REPowerEU Initiative
RW	Renovation Wave
WP	Work Package

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1 Introduction. Skills & training, at the core of HP EU wide deployment

Against the backdrop of the hardships and global energy market disruption caused by Russia's invasion of Ukraine and in order to curb the climate crisis, the European Commission (EC) presented on the 18th May 2022 the REPowerEU (RPEU) Plan Communication, a comprehensive package of measures to address massive *energy savings*, wide diversification of *energy supplies*, and accelerated roll-out of *renewable energy* in households, industry and power generation, particularly HPs[2].

The ambitious objectives set forth by the RPEU Plan mean that by 2030 that the number of HP related workers in the EU (manufacturing, installation, maintenance) be increased by 50%, and that out of the existing workers, at least 50% will also need to be reskilled to work with HP technologies (electric, hybrid, thermal). Already today, with about 1.5 million installers in the EU -most of them small companies- the employment rate in installation and maintenance is significant. This is an enormous challenge as HP installation requires twice as much time as boilers, according to the European Heating Industry (EHI).

On the other hand, installers play an additional and crucial role as consumers rely above all on their advice as last mile contact for periodic checks and maintenance beyond installation. According to European Heating Industry (EHI) close to 80% of consumers buying new heating systems receive advice from an installer and about 96% of them follow that advice either completely or to a great extent[3].

For this reason, the RPEU initiative deserves particular attention to establish a *Large-scale Skills Partnership* to maintain and regain technological and industrial leadership in key areas and to support the workforce.

[2] Doubling of the rate of deployment of heat pumps over the next 5 years resulting in a cumulative ten million units

[3] EHI- Centerdata (2021): Consumer study on purchase decisions regarding heating appliances

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2 The HP4ALL project, an enabler for HP skills enhancement

HP4ALL aims to facilitate an increased market demand (procurement and contracting services), a large-scale rollout and a further advancement and uptake of heat pumps (HPs) technologies and systems for residential and non- residential applications, **with the subsequent market boosting of related skilled workforce demand and provision** by:

- Providing HP related tailored, sound, key information to all relevant stakeholders and users, thereby facilitating their decision-making process

- Paving the way for a more robust level of skills in the HP value chain, ensuring high quality and reliability from the supply side

To this end HP4ALL has developed a set of tools and resources -the so called **HP4ALL package**-:

-An **HP Competency Framework** to facilitate Mutual Recognition of HP Skills. It will allow manufacturers, designers, and installers to benchmark their knowledge and skills to determine if they are meeting the needs of the market. Such a framework will also facilitate mutual recognition across the EU.

-A user-oriented **HP Knowledge Hub** to provide guidance, support, and tools (e.g., technical information, case studies, procurement guidance) to increase the demand for HP skills and knowledge

-An **HP Benchmarking Tool** enabling end users to consider options and performance of HP technologies within different building and application types

-A dossier of tested **Awareness Campaign materials** to assist in the EU-wide roll out of heat pumps and the replication of the HP4ALL project success.

This group of mutually reinforcing measures encompasses proposals for legislative and administrative adjustments to foster skills offerings and demand for those skills, labour market consolidation schemes (e.g., updated competency frameworks and requirements for skilled workers in procurement and dedicated training schemes for installation & maintenance professionals), incentives (based on success stories), and ambitious private and publicly supported dissemination & communication packages targeting end users and market demand via behavioural patterns changes and engagement, amongst others.

The HP4ALL consortium has been interacting with the **entire HP value chain**, both the supply side (manufacturers, engineers, designers, installers) and the demand one (building owners and end users form all sectors -residential, industry and tertiary).

With a view to ensuring its widest adoption at EU scale the HP4All package has been disseminated, tested, validated, and fine-tuned by means of **three implementation plans** with

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different and complementary approaches in three partner regions with varying stakeholders and scenarios, these regions include **Upper Austria, Andalusia, and Ireland**. The ultimate goal is that the HP4ALL package be tailored to different market conditions throughout the EU, raising awareness of and assuring commitment to the abovementioned objectives.

The impact of HP4ALL will be maximized through the involvement of the **Observer Countries** (HR, PT, RO), following closely the development and validation of the HP4All package, and acting as early adopters thereof even before the project ends.

The implementation plans have been informed by **extensive stakeholder engagement** to spot and map current and future barriers to HP market exploitation and skills development.

Leading experts in the HP and Energy sector have provided feedback for and participated in the preparation and deployment of these implementation plans through a set of consultations, workshops, and events.

HP4ALL long-term EU-wide outreach will be guaranteed by a dedicated **Replication Plan**, which is the subject of the present document, including guidelines for train-the-trainer actions, a roadmap for the HP4All package extended usage and an outward-looking awareness campaign.

In parallel to the above, a coherent set of framework supportive **Legislation & Policy Recommendations** has been drawn up, whose key messages are also incorporated herein

3 The HP4ALL package. Findings & learnings

3.1. Competency Framework

Building on the outcome of previous outputs of the HP4ALL project, including:

- Heat Pump Experts - Survey of Skills Needs & Opportunities
- Training Providers Survey
- National and European Union Prospective Training Frameworks Analysis
- Evaluation of current public and market acceptance of HPs

A comprehensive picture of the diverse engaged stakeholders, their current status, upskilling/reskilling needs, learning and adaptation barriers, and future opportunities has emerged.

The HP Skills Competency Framework has been set up according to an iterative and participative process whereby at every stage it has been presented to and checked with the sector through a consultative process involving a number of mechanisms, that included:

- Stakeholder workshops and surveys at EU and international level

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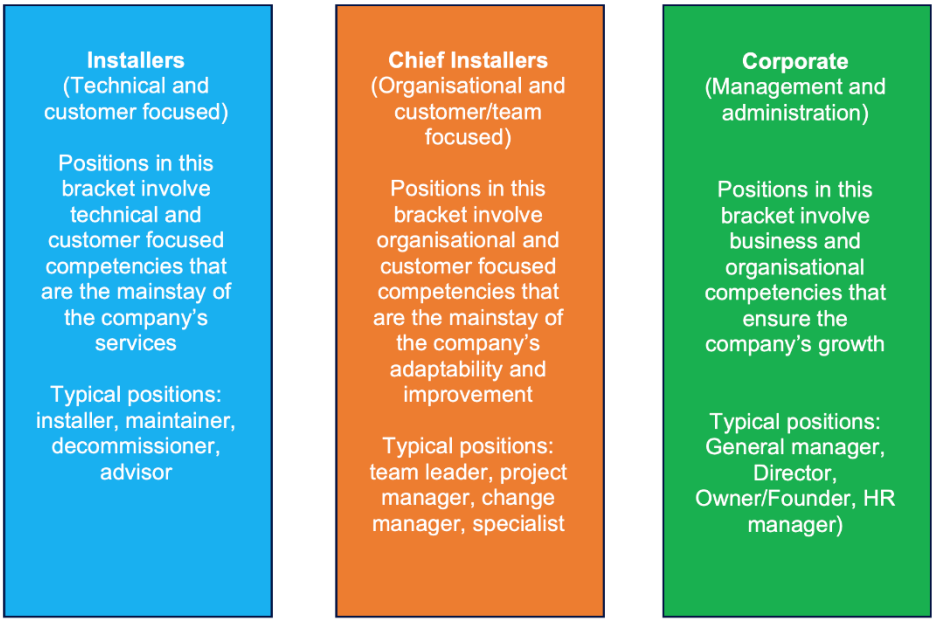
• National /Regional HP Expert Groups consultations and interviews

• EHPA membership and network consultations, including panel discussions during EHPA organised events.

• Desk research -including other EU projects- and comparative assessment of competency models from other fields (e.g., OECD)

• Key events (e.g., Chillventa, EHPA Forum, Regional /National HP Forums)

Based on the extensive previous research that uses multiple tools and interactions with experts from the field as well as training providers, while also examining the work being done in other projects and gathers models from other fields, the Competency Framework can be found below. It uses colours to identify the job families of the value chain, as well as competency clusters that group the core competencies, being followed by definitions and key indicators (in D3.2.2.). As such, Segmenting job positions into families along the value chain of an organisation or sector determine (depending on the size of the organisation) whether it has the capabilities necessary to achieve maximum impact/efficiency and the capabilities necessary. This segmentation can be used to set the requirements for each position in the organisation, to view potential skills needed for each level, to provide learning/training opportunities, and to design structured career development programmes based on organisational and market needs.
With three main segmentations have been made, be aware that these intertwine in individuals and/or teams and that (given the size of the organisation, previous learnings, location, technical legal requirements, market fluctuations etc) a professional working in the heat pumps sector would need most of them to participate in a competitive market.



In addition to the HP4ALL HP skills and Competency framework, the HP4ALL project wishes to engage with adopters of the framework and the HP4ALL package to discuss the future prospect of mutual recognition of HP skills in different regions. Each EU member state sets its own national system of education and training, which leads to its own professional

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qualifications. The EU has systems for recognising training that enable professionals to make full use of their training and skills in another EU country (or one that has bi-lateral agreements with the EU). The basic principle is that professional qualifications from a person's home country to qualify the individual to work in the same profession in another EU country.

Specific conditions apply depending on profession and the length of stay. If the profession is regulated in the new country, the professional will need to register with the regulator for that country before starting work. The bodies which regulate professions may also be called competent authorities. Some Examples of Regulated Professions:

1. Electrician (Registered Electrical Contractor),
2. Gas installer (Registered GAS Installer),
3. Architect.

3.2 Knowledge Hub

As part of the HP4All project, a heat pump knowledge hub was planned to be developed in order to help pilot regions with their regional development plans and pilot activities.

The knowledge hub is to act as a library of Best Practice Guides, Case Studies, Technical Reports, Procurement Guides, and Webinars that will provide information for heat pump owners and encourage building owners to install heat pump in their buildings.

The HP4ALL consortium discussed the different sections and found that 3 sections would be necessary as a minimum as some resources are only applicable to certain stakeholders, these sections include:

1. Non-Residential: This section will have resources aimed at commercial and non-residential heat pump stakeholders including installers, designers, and end-users.

2. Residential: This section will have resources for homeowners, installers and designers that are working with residential heat pump installations. It was decided that splitting this section into two further sections (New-Build and Retrofit) was unnecessary as the learnings from both would be the same.

3. Workshops: This section will include any events or workshops that include the HP4ALL project.

The final Knowledge hub is a collection of information, resources, and tools, that have been created by various actors in the heat pump value chain, which are designed to increase end user knowledge and awareness.

Each resource was reviewed and analysed by the pilot leaders before being added to the knowledge hub, this was to ensure that a common theme would be present on the knowledge hub. This common theme relates specifically to the target audiences and languages of each pilot region, so it was deemed necessary to create 3 separate knowledge hubs in order to have the greater impact.

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3.3 Benchmarking tool

A HP benchmarking tool has been developed as part of the 'HP4All package', a set of innovative tools and resources that will be used by various stakeholders within heat pump supply chain.

The tool has been integrated within the HP4All Knowledge Hub, which will further facilitate end users with heat pump knowledge and awareness.

Three different tools have been developed to address the different needs and target sector of three pilot countries. IERC developed HP Benchmarking tool for Ireland and Spain whereas ESV developed HP Benchmarking tool for Austria.

The aim of the tools is to create awareness among end users about operational cost of heat pump and encourage them to install a heat pump in their premise.

The tool serves as decision-making tool by providing information about operational performance (for example seasonal performance factor, expected annual energy consumption and annual energy cost for running a heat pump) based on the type of building and heat pump technology.

The tool will help end users to evaluate the performance of a heat pump installed or that they are planning to install within their premises. It will also encourage end users to develop basic awareness regarding energy tariff applicable to their building, annual energy consumption, energy cost and energy rating of their building.

It will provide the estimated annual electricity consumption for heat pump to provide space heating and water heating. The tool will also provide the estimated annual cost for electricity being consumed by heat pump.

This information will help end users to perform a cost benefit analysis and make a decision for installing a heat pump in their premise. Ultimately, the tool will increase awareness about heat pumps and their operational information and will lead to an increased uptake of heat pump installations.

The tool asks some basic information about user's building, for example type of building, area of building, energy rating of building, type of heat pump installed or planned to be installed. Based on all these information provided by users and using a national energy consumption database tool, it predicts the annual energy consumption and the energy cost for running a heat pump.

The HP Benchmarking tool designed for Ireland predicts the average annual electricity consumption and average annual electricity cost for running a heat pump for space heating and water heating in the residential setting. The target audience for the tool in Ireland are homeowners or users planning to install a heat pump either during renovating an old house or during building a new house.

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The Heat Pump Benchmarking Tool designed for Spain follows a similar approach as Ireland. It asks user to provide information about their home and then compares/benchmark user's home with a similar house in their region. The target audience for the Spanish tool are public buildings owners/tenants, who are planning to install heat pumps within their building.

The Heat Pump Benchmarking tool designed for Austria assess the real-life Annual Performance Factor of residential heat pump installations. It determines the "in situ COP" (Coefficient of Performance) of a system and offers a general indication on the performance level compared to other systems of the same type (air source heat pumps, ground source heat pumps).

The tool is primarily offered to end-users of residential heat pump installations who would like to assess the efficiency and real-life or in-situ performance of their systems. The result is presented on a coloured scale (green to red), indicating the level of performance compared to other systems of the same type.

3.4 Awareness raising materials

Webinars played a vital role in keeping the momentum of the project awareness, from the Irish pilot in particular.

The Irish pilot leaders worked with the Heat pump association and leading experts in the field of retrofit, Nearly Zero Energy Buildings, Insulation, ventilation, and airtightness to raise homeowners' awareness of products, control strategies and innovations in the sector. They also aimed at providing installers with clear cut and digestible learning materials for better homes and better heat pump installations.

These webinars are freely and openly available on YouTube and are an excellent source of knowledge for heat pump professionals and homeowners alike.

Workshops played a key role in dissemination of the project. They helped provide a good understanding of the HP market in each pilot region.

Separating each of the stakeholders and hosting different workshops will also help with getting a better understanding of the politics of the heat pump value chain and where each stakeholder whether it be the designer, the installer or the commissioner of the heat pump systems perceives where issues lie.

Newsletters & Leaflets were used to promote the project and activities. The online newsletter was distributed to a mailing list every quarter in order to maintain momentum. A leaflet was created in the Irish & Upper Austrian pilot targeting end users of heat pumps.

The leaflet was distributed through local authorities in the Irish pilot and distributed at trade fairs and events in the Upper Austrian pilot.

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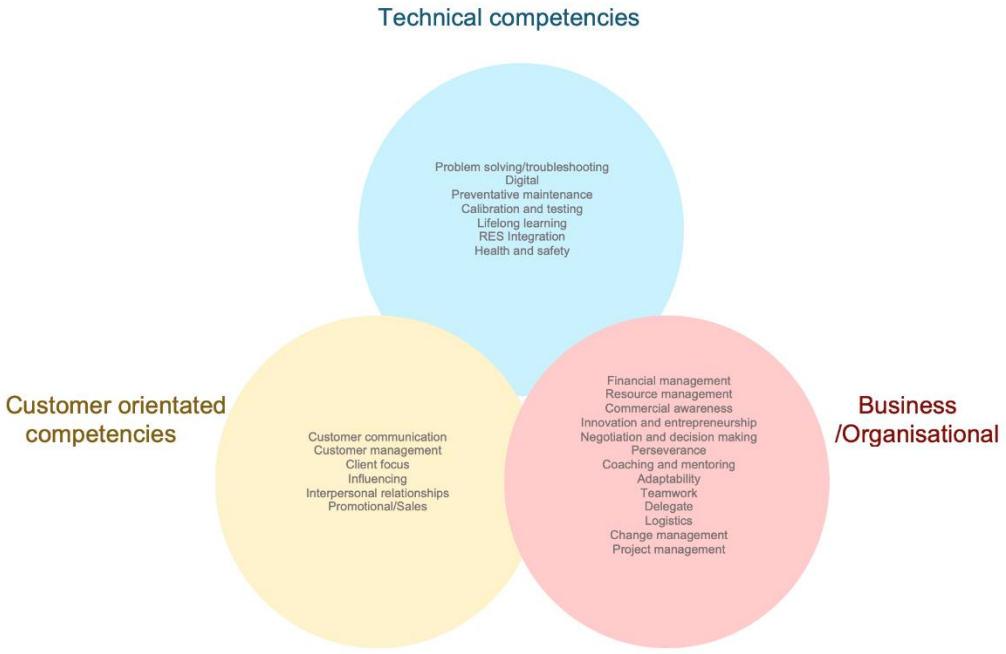
4 HP4ALL package replication

4.1 Proposed replication measures & tools. Practical guidance

4.1.1 Competency Framework

HP4ALL Competency Framework contains all the relevant information regarding the HP Skills and Competency Framework, building upon the Draft being prepared in early 2022. With a set of core competency clusters being defined:



These are explained in detail in the Competency Framework with the Mutual Recognition Agreements. offering several avenues for replication and improvement. I.e.:

- The different competency levels need to be tested;
- Further work with training providers on the competency framework validation needs to be pursued; closer alignment with National Heat Pump Associations (members of EHPA) in the area of training, qualifications and mutual recognition is needed (indeed this was suggested by the National Heat Pump representatives);
- The addition of other clusters can be considered (e.g., value chain logistics, manufacturing including robotics and 3D printing, research and development) as per a complete value chain approach;
- Collaboration with likeminded projects was pursued, however, new relevant projects that can be built upon are steadily appearing;

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- Direct inputs and examples of manufacturer provided trainings have been included in the deliverable, but further work is needed to fully appreciate the wealth of capabilities offered directly by these companies;

- EHPA does not currently have Heat Pump National Associations in all countries of Europe, and as more are created and grow, a better picture of variables and needs can be achieved.

The Mutual Recognition Agreements between the HP4ALL project and adopters entails a signed agreement between adopters of the framework and the HP4ALL package and the HP4ALL project that is intended to commence a dialogue. This agreement is not legally binding, it is only the first step in the dialogue to allow professional qualifications from a person's home country to qualify the individual to work in the same profession in another EU country.

The second step of the HP4ALL Mutual Recognition agreement outlines a process for information exchange between the HP4ALL project and adopters, the information exchange includes :

1. Information on how other trades become mutually recognised in both regions
2. If there is a process to become a registered Heat pump professional or Heating System professional encompassing heat pumps in each region.
3. Certifying Authorities in both regions.
4. Information on Heat Pump Training in each region.
5. Information on subsidies / Grant funding where training is a requirement to receive funding

4.1.2 Knowledge Hub

D4.5 Final Knowledge Hub contains all the information on the three knowledge hubs. The main take away from the Knowledge Hub experience in the HP4ALL project is that each region knowledge hub needs to be specific, due to differing languages, market maturity and target audience to that specific region.

To replicate the HP4ALL Knowledge Hub it is important to have a clear understanding of the following:

- Heat pump market maturity: Is there significant work being done in the heat pump market and is there already an affinity towards heat pumps with end users.

- Heat pump market main players: Who in your heat pump market is a key stakeholder and is there room for collaboration.

- Market challenges: what challenges are there in your heat pump market? i.e., Is there a performance gap issue, where heat pumps are being installed incorrectly.

- The Target Audience: Who will be the content on the knowledge hub be targeted at? Residential / non-residential, etc.

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- Content: The content can either be handpicked from trusted sources or created in the case of a knowledge gap. It is important to really pin down what you wish to exploit with the content and to have a common theme.

- Case Studies and Examples: it is important to showcase exemplar case studies in your region and promote good practices.

- Tools: It is also important to showcase tools that are available in the market for free use, this will increase the applicability of the knowledge hub.

- Disseminate and Communicate: It is important to continuously communicate the knowledge hub to an audience.

4.1.3 Benchmarking tool

To replicate the Heat pump benchmarking tool, the following points needs to be considered -

- Decide the category/sector/group of the target end users, who will use the tool.

- Check the availability of national database reflecting energy consumption of the target sector buildings.

- Analyse the granularity of the data available in the national energy consumption database.

- Consider the level of information available at the users end to be fed into the tool by the users.

- Design approach and methodology of the tool needs to be adapted according to the level of information available from user and granularity of the information available in the national energy consumption database.

- Try to keep the input information required from the user and output information provided by the tool very simple and easy to understand.

- Take into consideration the effect of climatic condition of the specific country in the performance of the heat pump while finalising the methodology of the tool.

- Make suitable assumptions in case the user fails to provide any technical information about the heat pump they have installed or planning to install.

- Keep in mind to design the tool or provide output such as the output serve as decision-making information for the user and encourage user to install the heat pump within their premises.

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To replicate the HP Benchmarking tool, availability of national database about energy consumption for target sector is the most essential requirement.

The design, approach and methodology of the tool then hugely depends on the granularity of the available data within the national energy consumption database. Try to contact national energy agency or national universities if the database is not available directly.

National energy agencies and universities could help to make the database available for use. The tool could be different for each country depending on the availability of national energy consumption database and granularity of the data in the database.

Below is the brief methodology for all three tool that explains how the availability of national database and its granularity changes the tool and its methodology.

HP Benchmarking Tool for Ireland

In Ireland, Sustainable Energy Authority of Ireland (SEAI) has made a very comprehensive national BER database publicly available for the purpose of research. This database:

- Contains annual energy consumption of all the houses of Ireland (registered in National BER register) according to the BER rating of individual house.

- Categorises the annual energy consumption based on type of house (for example apartment, semi-detached house, detached house, mid terrace building, end terrace building etc.), energy rating of the house and area of the house, irrespective of type heat pump installed.

- Annual energy consumption has been further categorised into energy consumption for space heating, water heating, ventilation, lighting etc. Climate zone is same through all over in Ireland, therefore; weather does not play any specific role in the operation of heat pump in Ireland.

Hence, the HP Benchmarking tool for Ireland asks user to provide information in line with the information provided by user for example type of house, energy rating of their building and area of their house.

Based on all these information provided by the user, the tool fetches most suitable data for space heating and water heating from the database to calculate the annual energy consumption for space heating and water heating.

The tool further ask user if they know the average unit price of electricity for 24 hours applicable to their house.

If user provide and answer to this, then tool uses user's data to calculate the annual energy cost for space heating and water heating.

If user fails to answer about the unit price of electricity applicable to their house, then tool makes suitable assumption about applicable unit price of electricity as per the data published by SEAI and then calculated the annual energy cost for space heating and water heating.

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HP Benchmarking Tool for Spain

In Spain, Building Energy Efficiency databases for old buildings (built before 2007) and for new buildings (built on or after 2007) are retrieved from two official publications of the Spanish Energy Agency (IDAE).

These databases provide average annual thermal heating demand (kWh/m^2; space heating and domestic hot water) both for individual households and block of buildings for each province.

Since annual thermal energy presented in database is for per unit of building area in m^2, hence, we need information about the area of the house. So, the next question the tool will ask is for the user is area of their house in m^2.

From this data, the tool is fed with the information about type of building (individual/block of building) and year of construction (new/old) that are in line with the data available in database.

In Spain difference in climatic zone play a crucial role on the performance of heat pumps, which is presented as Seasonal Performance Factor (SPF). In Spain, SPF is calculated by multiplying nominal COP of the heat pump with a weight factor (WF) and a corrective factor (WF).

Nominal COP is the COP calculated for heat pump in the standard lab condition, the weight factor takes into consideration the effect of climate zone categorisation on the performance of different technologies of heat pump and the Corrective factor outweighs differences between actual, operational, and testing temperature at which COP was calculated at lab scale.

SPF calculation largely depend on the nominal HP COP and on the climate zone where the HP has been installed. The nominal COP depends on the HP technology used, and the WF on the HP technology used and the climate zone.

Regarding the nominal HP COP, user have been given the option to directly provide its value if known or alternatively use a default value for the specific heat pump technology.

After receiving all these information, tool will first fetch the annual thermal heating demand per unit of area from the database and then by using the information about the area of the building the tool will calculate the annual thermal heating demand for the entire building

Finally, the tool will ask the user to provide information about average unit electricity price for 24-hours applicable to their building and will provide information about annual average electricity price for space heating and water heating.

HP Benchmarking Tool for Austria

In Austria the HP benchmarking tool calculates “in-situ” COPs because of easily available electrical input and heat output data.

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Austria has more advanced HPs systems in comparison to Ireland and Spain. In Austria, heat meters are installed in the HPs, which can be used to find out the heat output delivered. Also, HPs have their own electricity meter which can be easily accessed to find put input electrical energy.

The HP benchmarking tool for Austria asks to provide information about input electrical energy and output heat energy, and then calculates the real time COP or “in-situ” COP.

Next, the tool asks about the HP technology and represents the output in a colour scale (Green to Red), wherein the green colour indicates a good HP COP whilst the red colour highlights possible HP underperformance to be investigated.

Example of calculation:
Input data:

- Annual heat output of the system: 8000 kWh
- Annual electricity consumption of the heat pump: 2000 kWh

Calculation:
8000 kWh ÷ 2000 kWh = 4

Result:
Annual Performance Factor = 4.
For an air source heat pump, this result would be depicted in the "green" section of the colour scale. For a ground source heat pump, in the "yellow" section

4.1.4 Awareness raising materials

Awareness raising materials must be tailored to every target audience of the region, being in any case as concise, visual, clear, and easily available as possible, and coherent to each other.

If possible, they should be interactive (e.g. with a customized set of Q&A or sequential screens to be passed)

For workshops and webinars, it is recommended to seek speakers and presenters from other areas of the construction market, such as deep retrofit or shallow retrofit companies. This coupling with HP experts and suppliers provides a very enticing environment for end users.

For newsletters and leaflets the same rule applies, make the information digestible and memorable.

4.2 Replication policy recommendations

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Labour and skills shortages in the building energy renovation sector are one of the main obstacles that need to be seriously addressed to successfully implement the REPowerEU Initiative and related ones such as the Fit-for-55 Package, the Green Deal and the Renovation Wave.

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Although it was launched in a rather different geopolitical context, the EU funded HP4ALL project scope and goals intends to help cover these shortcomings, with a view to ensure a more robust skills and labour market domain in the HP value chain. As a result, *legislation and policy recommendations* stemming from HP4ALL come out timely.

This group of mutually reinforcing measures encompasses proposals for legislative and administrative adjustments to foster labour market consolidation schemes (e.g., updated competency frameworks and requirements for skilled workers in procurement and dedicated training schemes for installation & maintenance professionals), incentives (based on success stories) and ambitious private and officially supported dissemination & communication packages.

Main **recommendations** coming out of the HP4ALL implementation are:

1. Carry out an intensive EU-wide *marketing and awareness raising campaign* to ensure social recognition and visibility of energy & building renovation professionals with increasing and more complex skills. Put *installers* at the heart of it, due to their strategic role, without neglecting other stakeholders.

2. Adopt legal and market measures to improve *labour conditions*, avoiding temporality and fostering long lasting careers, gender balance, attractiveness to youth and workers from other declining sectors, and integration of vulnerable collectives to labour market niches and talent pools.

3. Address an overarching EU scheme for the *legal reinforcement of energy rehabilitation training & skills curricula*, with Member states and Regions addressing the optimal implementation specialization scheme and roadmap.

4. Draw-up EU-wide *minimum content guidelines* for specialised *training programmes* contents, either formal or informal, to avoid gaps. Continuous training for upskilling workers that are already in the sector must be made compulsory alongside providing opportunities for people outside of the sector to re-skill and join the sector workforce.

5. Advance and favour more agile VET *certification schemes that can be mutually recognised and repeated by other member states,* with simplified procedures for application and certification all the while using common reference frameworks so that good quality of HP workers is ensured.

6. Reinforce sustainable energy skills in *school curricula (*Apprenticeships, Secondary Level Education and Primary Education) ensuring that the opportunities for employment in the sustainability, energy and climate sectors are clearly presented to the future generations.

7. Boost *installation service quality assurance* mechanisms

8. Introduce more strict manufacturing & installation *solvency and implementation criteria* in related public procurement, as well as more demanding *quality/price ratio*[4] *targets*.

[4] This ratio is explicitly mentioned in the EU Directives on public procurement; t is a very good opportunity to pre-empt quality versus price-only driven contracts

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9. Promote *energy advice* and *energy renovation project management* as a job enrichment opportunity / new market niche / specialization itinerary, with appropriate financial support. One-Stop-Shops, clearinghouses and call centres can be used for this purpose, with appropriate and coordinated support from EU, national and regional funds, and private investment. This service would include training and signposting to certified, trusted professionals as is currently the case in some Member States.

10. Reinforce and provide *specific visibility and prioritisation* to energy rehabilitation education and training schemes and packages within the *Structural Funds* Regulations, particularly the European Social Fund (ESF+).

11. Put in place adequate *coordination mechanisms* (e.g., a Heat Pump Accelerator or an EU wide Public Private Partnership) to ensure complementarities and synergies at all administrative levels (EU, state, regional, local) and bringing in all stakeholders throughout the whole value chain, implementing fully or partially these recommendations depending on the context[5]

These recommendations take stock of two complementary situations:

- The situation of skills training for renovation in the EU level and best practice examples that could be scaled-up or replicated to boost the workforce for renovation across the EU as described in REPowerEU, May 2022.

- The interactive dialogue between the HP4ALL project and the entire HP value chain throughout the project duration (Sep-21 to present), both the supply side (manufacturers, engineers, designers, installers, trainers) and the demand side (building owners and end users form all sectors -residential, industry and tertiary).

4.3 Replication Plan D&C measures

HP4ALL partners are committed to continue disseminating the project results and goals at least two years after the project ends, so a wider impact can be reached.

Thus, the website and corporate channels will continue to be the main repository of documentation and the access to the key innovations developed.

[5] Following for instance the example of the energy savings obligation private funded French *national training network for energy renovation* or several public-private partnerships for energy renovation education in different Members States (The Netherlands, Denmark, Germany). Training centres and programmes are recommended by relevant ministries and industry associations.

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