Analysis report

2025

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Contents

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1. Introduction

The document “D2.3 Analysis Report” summarizes the qualitative and quantitative findings of WP2 and makes suggestions on the content and structure of the capacity building programme within the CBF and its supporting materials and resources. By combining quantitative and qualitative research methods, an effective analysis with a plan to address the shortage of skilled installers and professionals for heat pumps is made while promoting a sustainable and resilient workforce. It suggests action plan for networking and developing partnerships to deliver the CBF and build lasting cooperation to sustain the local capacities for heat pump deployment. Finally, the document establishes monitoring and evaluation framework for the implementation of the capacity building framework and provides guidance on how to deploy it.

The report consists of 5 chapters:

- **Chapter 1** *Introduction* presents the overall objective, structure and contents of the document;
- **Chapter 2** *Skills development* makes a broad analysis of the qualitative and quantitative outcomes of the market research and suggests action plan for skill development to be embedded into the capacity building programme;
- **Chapter 3** *Networking and partnership building* focuses on the networks to be established by the partners with relevant stakeholders to conduct and sustain the effects of the CBF;
- **Chapter 4** *Monitoring and evaluation* suggest evaluation framework for the performance of the CBF and its supporting activities;
- **Chapter 5** *Conclusion* wraps-up the document findings and suggestions.

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2. Skills development

Chapter two presents an overview of the findings from quantitative and qualitative research and builds a comprehensive upskilling plan upon them. The chapter outlines the Capacity Building Framework (CBF) and details the training program and its learning modules, tailored to the specific needs of heat pump installations and integrated solutions. It also discussed on how to attract professionals from other sectors, showcasing the benefits and opportunities in the heat pump industry.

2.1. Quantitative and qualitative outcomes

The **recommendations on the Capacity Building Framework (CBF)** follow-up on the findings from the quantitative[1] and qualitative[2] analysis done by the Re-Energize project partners.

In first place, the CBF needs to be a common framework for a diverse range of countries with various levels of market penetration of the heat pump technologies. In this sense, the CBF needs to **provide a few levels of theoretical knowledge and technical skills** that answer the demands of different partners depending on the starting point of each trainee. The CBF should have a strict and clear criteria for certification, including the completion of required training sessions, passing assessments, and meeting performance standards. There may be a differentiation between the different levels of certification based on mentees' baseline and final knowledge levels achievements will be offered.

The CBF needs to be a highly specialised learning and training programme that is also accessible to non-specialists and give them opportunities to develop new fields of expertise.

The workforce landscape in the heat pump industry across the partner countries reveals both common trends and regional disparities. While demand for heat pump technology continues to grow, challenges related to skills shortages, training accessibility, and workforce retention pose significant barriers to industry expansion.

Typically, the installers and technicians work across multiple sectors, including boilers, electrical installations, solar thermal and PV systems, and other domestic appliances. So, the scope of the CBF covers **not only heat pump professionals** who are knowledgeable in the field, but also **similar professionals** who may lack knowledge on the foundations of the heat pump technology. There is also strong preference for in-person meetings rather than online ones with a focus on hands-on experience and direct interaction with peers and trainers. Self-paced study formats are not desired by the potential trainees thus making online or virtual learning environments a low-key priority for the CBF and its execution.

[1] D2.1 Quantitative Research Report

[2] D2.2 Qualitative Research Report

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CBF should address a spectrum from fundamental theoretical knowledge to practical hands-on experience in installation techniques, maintenance, and troubleshooting as well as communication with the final customer. There is strong interest in cross-cutting topics and focus on heat pump integration on building level and with other energy saving technologies and their joint applications. The CBF should be aligned with the **contemporary standards of technical requirements** as well as **adopt innovative and advanced technologies** so that a future career pathway for the trainees is established. This will ensure career growth and development thus boosting the retention rates. It needs to provide require practical, technical training in system installation, troubleshooting, and compliance with energy efficiency regulations. Content-wise the market investigation prioritizes core technical competencies to be covered by the CBF - installation and wiring, whereas the specialized areas to be covered are HVAC diagnostics and integration and regulatory compliance. Moreover, the following topics must be embedded in the CBF:

- Knowledge of new heat pump technologies and industrial innovations
- System diagnostics and troubleshooting
- Design of shallow geothermal systems - specialized training in geothermal energy applications
- Energy efficiency and optimization
- Energy auditing, Building energy performance assessments
- Compliance with environmental and safety standards

In order for the CBF to be successful, it needs to **showcase that its content and execution will support both the businesses and their workers** in tacking the market challenges – i.e. needs for increased wages, insuring job stability and career growth, developing and expanding the skills set, providing quality knowledge and practice. The CBF needs to highlight the value of the CBF in respect to national certifications by explaining its relevance to industry standards and career advancement. There need to be promoted well-articulated benefits and incentives as well as its links to professional certifications schemes, regulated re- or up-skilling programmes, links to regulatory acts certifying the knowledge levels, and real-life knowledge and skill demands. In addition, the CBF needs to highlight its benefits linked to the realization

> *[There is a] fundamental challenge facing the heat pump industry: the urgent need for comprehensive, accessible, and high-quality training programs. Professionals and organizations alike highlight a widening gap between industry demands and the skills available in the workforce.*

on the labor market – increased wages, improved labour conditions, better social benefits, etc.

<u>Implications on the CBF format and its execution</u>

- The CBF training format needs to be highly accessible and flexible for various professionals, including with good territorial coverage, i.e. workers from small towns

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can also access it. The CBF needs to be promoted strongly among on the market and collaborations with umbrella organizations and provider companies established.

- The CBF needs to provide real-life cases and access to on-site demonstrations to address the limited hands-on experience. In order to support the uptake of market technologies, the CBF needs to showcase pilot installations and deployment of heat pump technologies. There may be supporting formats such as on-site mentoring or peer exchange programmes within the CBF.
- Partnerships with technology providers may be established so that showcase of specific technologies and on-site demonstrations of such is made. In addition, the lecturers need to be highly experienced and well-versed into the topic, with practical know-how and advice.
- Finally, the CBF needs to be aligned with certification schemes across the partnering countries or investigation of its certification on national level or through licensed training centers be made.

Recommendations for the CBF and its execution

- Different levels of theoretical knowledge and technical skills to be covered (upskilling vs reskilling sessions),
- Collaborations with highly experienced lecturers both on theory and practice,
- Collaborations with technology providers and provision of on-site demonstrations and pilot visits,
- Highly flexible and accessible modular CBF for all types of professionals,
- In-person sessions are priority to online and self-paced learning,
- Hands-on experience and technology demonstrations are highly valued,
- Possibility for better integration of market actors into the training via on-site visits, personal mentorship training or on-site training,
- Strong promotion of the CBF across various related market niches,
- CBF oriented towards addressing market challenges and well-articulated benefits (job retention rates, job stability, career growth, etc.)

Training is not just an option but a necessity for the future of the heat pump industry. Without a well-equipped and knowledgeable workforce, the sector will struggle to meet increasing market demands and sustainability targets.

2.2. Capacity Building Framework concept

The Capacity Building Framework is the detailed description of the learning concept, learning materials, teaching approaches and practical organisational issues. The framework describes the learning process through its general overview and purpose, specific learning objectives, learning/training content specified in dedicated modules, learning outcomes, and knowledge evaluation.

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2.2.1. General overview of the CBF learning programme

The CBF needs to offer relevant information and knowledge to its trainees that is well- aligned with the heat pump demands and market trends. It needs to cover technical aspects of heat pump installation, operation, maintenance, energy-efficient building design, and the integration of green technologies. Each level's curriculum will become progressively more advanced, ensuring participants acquire a solid foundation and can then specialize based on their career goals.

It consists of a learning programme divided in two thematic areas according to their level of complexity:

- Thematic Area I "Advanced Heat Pump Technologies and System Integration"
- Thematic Area II "Energy-Efficient Building Retrofit with Heat Pumps"

2.2.2. Purpose

The overarching purpose of the CBF is to increase the knowledge and skills of various professionals in the field of heat pump technology or similar for the deployment and integration of heat pumps in building.

The thematic areas of the CBF are designed at lower and higher-level knowledge and skills and thus have different aims:

- **Thematic Area I "Advanced Heat Pump Technologies and System Integration"** aims to equip building professionals and heat pump sector professionals with advanced skills and knowledge related to heat pump technologies and their seamless integration into existing and new building systems.
- **Thematic Area II "Energy-Efficient Building Retrofit with Heat Pumps"** focuses on enhancing the skills of building professionals and heat pump sector professionals in retrofitting existing buildings with energy-efficient heat pump systems.

2.2.3. Target groups

The CBF is designed as a market-oriented capacity building programme encompassing theoretical and practical knowledge and skills that are suitable for professionals and non-professionals in the field. The specific target groups of the training are:

<u>Specific trainees</u>

- Architects, construction workers, building engineers, energy auditors, quality supervisors, energy producers and/or retailers,

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- mechanical engineers; HVAC and/or RES workers, manufacturers, retailers and suppliers; system engineers; workers in the heat pump sector and related sectors; maintenance companies; fuel providers
- Technical high school students, university students (bachelor, master, PhD) in technical majors, incl. mechanical engineering, natural gas, HVAC, and PV installers

Extended audience

- Umbrella/branch organisation representatives, chambers of industry and/or commerce, associations
- Municipal experts in construction, energy, environment, and climate departments; representatives of regional and national institutions
- Experts at Energy Agencies and Centers
- Energy-related NGOs

2.2.4. Learning content and modules

The CBF should be primarily targeted to professionals who are already involved in the field and have technical knowledge and competences that can be upgrade; then, it should address the re-skilling domain. In short, upskilling can guarantee the market development in a more cost-effective and sustainable way than the re-skilling domain.

The CBF modules can be organized in a two-fold way:

- upskilling sessions for heat pump professionals with less theoretical and more practical examples, including demonstrations and pilot projects,
- reskilling sessions for non-professionals with more in-depth technical theory and less practical experiences.

These two modalities may be combined in overall training agenda where both streams of trainees can attend the sessions they are allocated to based on initial assessment .

The CBF needs to be focused on real life learning and training activities related to on-site demonstration and practical experiences. Nonetheless, it is important to provide online training materials and access to online repositories of information and audio/video streams. The online modality of the training can offer light and easy-to-follow modules that may be of interest to an extended audience. This will also improve its promotion and wide-spread dissemination.

Content-wise, the CBF may have two thematic areas of the CBF are comprised of major topics that are then subdivided in sections and topics. For each of the training modules, there need to be specified duration, aims, content, teaching method and educational tools/materials.

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Thematic Area I "Advanced Heat Pump Technologies and System Integration" (Table 1)

- Heat Pump Technology Advancements
- Inside the Heat Pump: Cycle, Components, and Emerging Technologies
- Around the Heat Pump: System Design and Integration
- Heat pump installation, commissioning and maintenance
- EU regulation & consumer communication

Thematic Area 2: "Energy-Efficient Building Retrofit with Heat Pumps" (Table 2)

- Building Heat Transfer and Energy Audits
- Retrofitting with Heat Pumps
- Financial and Regulatory aspects of Retrofitting Projects

For each of the areas, the main topics are listed and details on their contents and learning requirements presented in Table 1 and Table 2.

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Table: 1 Thematic Area I "Advanced Heat Pump Technologies and System Integration"

№	Topic	Summary of content	Theory	Type of Practice	Method
1	Physical principles of heat pump technologies	The module presents the fundamentals of Thermodynamics, Fluid Mechanics and Heat Transfer. Trainees will be equiped with in-depth knowledge in heat pump technologies' physical principles.	Approx. 10 hours	-	Lecture Discussion
2	Inside the Heat Pump: Cycle, Components, and Emerging Technologies	The module explores the inner workings of domestic and basic commercial heat pumps. It reviews the key elements of the refrigerant circuit (cycles and components) and introduces recent trends in product design and technology. Trainees will learn about the Fundamentals of Heat Pumps, Vapour Compression Cycle, Refrigerants, Compressors, External Heat Exchangers, Expansion Devices, Ancillary Components in Heat Pump Systems and will acquire knowledge of heat pumps' catalog data.	Approx. 10 hours	In-lecture demonstration	Lecture Demonstration Discussion
3	Around the Heat Pump: System Design and Integration	The module provides a comprehensive overview of HVAC system design, with a focus on the integration of heat pumps in both domestic and small commercial applications. Participants will gain competence in general parts of HVAC system, heat pumps operational specificities for successful integration with the buildings, performance and control of terminal units, hydronic elements that connect the heat pump to the terminal units as well as typical system configurations.	Approx. 10 hours	In-lecture demonstration	Lecture Demonstration Discussion
4	Heat pump installation, commissioning and maintenance	The module provides an overview of the practical aspects involved in the deployment of heat pump systems and covers the selection and installation of different types of heat pumps, correct commissioning practices as well as preventive and corrective maintenance.	Approx. 10 hours	On-site Practical example	Lecture Demonstration Practical example Discussion

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№	Topic	Summary of content	Theory	Type of Practice	Method
		Trainees will be equipped with the essential technical knowledge and hands-on skills needed to install and maintain heat pumps safely, efficiently, and in compliance with applicable standards.			
5	EU regulation & consumer communication	The module covers two final aspects important for completing the initial training program. It provides an overview of the EU regulations relevant to heat pump deployment and develops effective communication skills and marketing arguments for actors in the heat pump market. Participants will gain competence in the EU Policy Framework Driving Heat Pump Adoption, F-Gas Regulation and Eco-Design Requirements for Heat Pumps, European Standards for Heat Pump Testing, Principles of Effective Technical Communication, Communicating the Benefits of Heat Pump Systems and Using Digital Tools and Media for Consumer Outreach.	Approx. 10 hours	-	Lecture Discussion

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Table: 2 Thematic Area 2: "Energy-Efficient Building Retrofit with Heat Pumps"

№	Topic	Summary of content	Theory	Type of Practice	Method
1	Building Heat Transfer and Energy Audits	The module provides students with a basic understanding of how energy moves through buildings and how to audit existing buildings in order to retrofit old heating systems with heat pump-based solutions. Trainees will learn about Components of Building Heat Loss and Gain, Heating and Cooling Loads, Fundamentals of Building Energy Audits, Basic Instrumentation for Energy Audits, Basic Data Collection, Envelope Retrofit Strategies as well as Measurement of: boiler efficiency; heat emitters output; hydronic circuit performance.	Approx. 10 hours	In-lecture Practical example	Lecture Practical example Discussion
2	Retrofitting with Heat Pumps	The module provides focus on how to correctly assess the necessary changes and modifications to a conventional building heating system to replace the existing heat generator with a heat pump. Trainees will be equipped with essential technical knowledge on how to: lower water temperature in hydronic heating systems; modify hydronic circuit; perform electrical integration of heat pumps. They will also gain knowledge about commissioning procedures.	Approx. 10 hours	In-lecture Practical example	Lecture Practical example Discussion
3	Financial and Regulatory aspects of Retrofitting Projects	The module provides an overview of the demand for retrofit and different types of retrofitting projects. It focuses on the unique challenges of retrofitting and integrating advanced energy solutions to them. The regulatory aspects needs to cover the building types and structures, energy interventions, and linked health, safety and environmental topics. It makes on overview of the financial aspects, incl. cost structure, financial drivers and value proposition, financing schemes and partnership building.	Approx. 10 hours	-	Lecture Discussion

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2.2.5. CBF methodological approach

The methodological approach of the trainings should cover the three stages: introduction, planning and implementation of the training.

Introduction

First: The creation of the general aim of the training by the trainer. During the development of the general aim of the training, it is advisable to take into consideration the following issues:

- whether the size of the group allows the use of class time efficiently
- whether the participants of the training are able to gain specific knowledge in the given time
- whether all the goals are to be achieved during the training
- to what level all the skills must be mastered

Second: The evaluation of the skills, knowledge and abilities required or the trainer to complete the training in the following areas:

- specialised knowledge
- experience in leading the training
- time required to prepare and conduct the training
- amount of work needed to prepare the training
- self-motivation required to carry out the training

Planning

First: Preparation of the training program. Before beginning the development of the training session, a trainer should contact other people running the training to exchange experiences and to eliminate duplicate content. For each module, there need to be defined:

- detailed objectives
- content of the training
- methods used
- tools / media
- training materials

Second: Planning the evaluation. Evaluation of the training can apply to the quality of a particular training or its effectiveness.

The evaluation of the training is usually conducted by the participants after the training ends. It can concern the whole training, individual modules or themes, methods, trainers, etc. The evaluation of training allows partners to learn from the participants whether and to what extent their expectations were met, and which parts can be improved and how. The main

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evaluation methods include questionnaires, verbal summary, video recording and observations.

The evaluation of the effectiveness of the training focuses on the extent to which the objectives have been fulfilled in terms of changing attitudes, and gaining new knowledge and skills. To measure the effects of the training the following methods are used knowledge tests, questionnaires to study attitudes and skills, observations made by the trainer, or interviews.

Third: Organisational issues. Organisational issues refer to the time and place of the training session.

Location/venue of the training. Generally, the venue should provide the participants and the trainer with the best conditions for learning and working. Longer training sessions should take place in special training centres. It is the trainer who decides the venue of the training, taking into account the following factors:

- classrooms, teaching and technical equipment, training facilities
- accommodation, catering
- environment
- accessibility

Either inside the room or in close proximity outside it there should be a space for coffee and tea. The room should be located near the toilets. Before the start of the training the trainer should make a list of necessary educational tools and make sure that the chosen training centre is able to provide them; if it cannot, the trainer should rent them or bring his/her own. It is essential to always make sure that the necessary equipment is in working order.

The trainer needs to determine the time frame needed to carry out the training, the trainer must take into account:

- The program and training objectives broken down into smaller sessions (1.5-2 hours) and breaks.
- The participants' concentration time and active vs passive learning.
- The activity of participants during the day, which is variable.

<u>Implementation of training</u>

Training should begin with introductions. The trainer first introduces herself/himself, followed by the trainees. Self-presentation is predominantly verbal but can be supported by media. Self-presentation should include: formal and informal qualifications, skills, professional interests and personal hobbies.

Presentation time should not exceed two minutes per person and comment on other people's presentations should not occur.

The trainer should inform the participants about the organisation and course of the training and distribute the schedule and training materials.

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When conducting the training, the basic principles of communication should be borne in mind:

- Two thirds of communication is non-verbal (such as gestures, facial expressions, appearance, voice, movement, distance)
- eye contact is the primary way of connecting with a group
- speech should be loud, clear, at the right pace and with the correct voice modulation. The active voice should be used to address the audience, and complex and difficult terms should be avoided.

The training uses both traditional teaching methods and activating methods.

Traditional methods

The traditional methods include **lecturing**. This method allows the students to gain familiarity with the new information and expand their knowledge, but can only slightly affect a change in their attitudes and can hardly ever allow them to learn new behaviours and skills. During the lecture, it is necessary to help the listeners to focus. This can be achieved by planning the lecture for no more than 45 minutes (ideally 20-30 minutes) in three sections:

- attracts the interest of participants
- explains the structure of the lecture
- presents the goals of the lecture

Please note that on average, only 20-50% of information presented through a lecture is remembered by audience members.

Activating methods

The activating teaching methods are based on the group process and activate both the trainees and the trainers. These are used to change the dynamics of the learning process and thus make it more effective.

Some of the most common methods are:

- Discussion – involves the exchange of views. Used to better understand problems, formulate and present own arguments, and think critically. Each discussion must end with a summary. The session should not last longer than 45 minutes. Its final result should be a potential solution to the problem.
- SWOT analysis – used in situations where the meaning of an alteration is considered or the decision made in a particular case is evaluated. During the evaluation, the strengths, weaknesses, opportunities and threats are considered.
- Role playing – the main goal is to present a particular situation, to feel the position of another person, and to experience the things that happen in reality. Role-playing allows participants to see themselves in a particular real life situation, realise intentions, preferred

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values, relationships with others, and understand the thinking process and behaviours of others.

Other effective methods which can be used while conducting the classes include:

- Learning in small groups – allows stronger involvement of shy people and better understanding of the problem.
- Workshops – these are meetings of participants with experts (people with significant experience in a particular field), organised in order to solve specific problems. The workshop is a form of group activity. During such a meeting, plenary sessions, small group discussions, etc., are conducted. Workshops can last one day (short workshop) or several days.

2.2.6. Materials and resources

Each CBF learning and training sessions need to be supplemented by the following materials:

- Curriculum / Training programme and training algorithms
- Train-the-trainers guide
- Guidance on the practical exercises, methodological aid
- Presentations and other lecturing materials and sources (videos, books, etc.)
- Guidance on the pre- and post-evaluation forms
- Trainees' Students Book

Supporting equipment and facilities for the training are:

- Computer + projector + screen
- Flipchart + markers
- Paper, pens, 1 pair of scissors
- Laptops. For the purpose of practical exercise 1, the best option would be to have 1 laptop per 1 participant; participants can also be asked to bring their own computers.
- Accessible toilets
- Room for coffee breaks
- Cloakroom/rack for coats

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3. Networking and partnership building

The section formulates the types of market actors that needs to be involved in the planning, execution and follow-up of the CBF. It lays the foundation towards the development of the partnerships needed to facilitate the CBF implementation and outline their roles and responsibilities in reskilling and upskilling efforts.

3.1. Stakeholder identification and role allocation

The CBF needs to unfold based on sound partnerships with various market actors so that is facilitates the flows of trained professionals from the trainings to the market. It is essential that the CBF strengthens the collaboration and partnerships between medium and high education institutions, labour force actors, and market businesses, and ensure the flow of well-trained specialists from the trainings to the real-life implementation sites and pilot projects.

Structured partnerships with CBF implementers and market actors within the heat pump market are the central element of the CBF framework. The CBF implementation may require the involvement of experts from various fields of expertise. Their competence, commitment and continuity are important for an effective and systematic delivery of the CBF. Therefore, integrating all relevant stakeholders throughout the CBF process is fundamental to achieving its goals.

In order to achieve successful implementation of the training, various stakeholders need to be involved in its delivery. Partnerships with them add value to the CBF development and are important for the effective and systematic implementation of the CBF. Main stakeholders to be addressed for partnering during the CBF implementation are:

Professionals

- Umbrella organizations: chambers of commerce, industry associations, innovation and technology hubs, professional associations
- Professionals: building engineers, mechanical engineers, HVAC and/or RES installers, system engineers, and architects, workers in the heat pump sector and related sectors, equipment manufacturers, distributors and suppliers
- Students: technical high schools students, university students (bachelor, master, PhD) in technical majors, incl. mechanical engineering, natural gas, HVAC, and PV installers

Non-heat pump professionals

- Energy professionals: Energy performance consultants and auditors, energy service companies (ESCO), energy agencies and centers,
- Public authorities: municipal energy experts, representatives of regional and national institutions responsible for energy efficiency, environment and climate actions,
- Civil organizations: NGOs, community organizations and citizens

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Training and employment institutions

- Educational and vocational training institutions,
- Educators and training providers, incl. teachers in professional high schools and technical universities
- National and local employment services

The networking activities need to focus on building mutual understanding and concept of the CBF implementation in order to build a community of practice and encourage cooperation that will nurture the market uptake. Extensive and early engagement from all stakeholders is key for achieving an agreement on the final execution of the CBF. Their role and interest in the CBF implementation are summarized in Table 3.

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Table: 3 Stakeholder involvement matrix

Stakeholder type	Role	Current market barriers	Future desired change	Drivers to support the CBF
Umbrella/branch organisations (associations, chambers, professional fora)	Bridging private companies with workers	Overall lack of interest to implement highly ambitious energy projects	Increased public awareness and acceptability of Heat pump technologies and their integration in buildings; extending their market participation	Improved public and market uptake of Heat pump technologies and other green energy solutions
Private sector companies	Offer and implement heat pump solutions	Overall lack of interest to implement highly ambitious HVAC projects	Increased public awareness and acceptability of Heat pump technologies and their integration in buildings; extending their market participation. More awareness about HVAC solutions and their benefits.	Improved public and market uptake of Heat pump technologies and other green energy solutions
Technical high schools, universities	Educate and train students	Low levels of transition from academia to the market; low retention rates	Improved academic knowledge and capacities of their students to design and implement HVAC projects. Ensuring fast track to market realisation	Increased knowledge and awareness of the contemporary technological requirements and technical developments
Training institutions (VOC)	Train workers across different fields	Low levels of transition from the training institution to the market; low retention rates	Improved academic knowledge and capacities of their students to design and implement HVAC projects. Ensuring fast track to market realisation	Further training and education; life-long learning and training; increase in the capacities of both trainers and trainees
Public Institutions	Implement EE and RES actions, potential pilots	Lack of sufficient funding for advanced projects, lack of technical expertise	Increased energy efficiency in the public sector, increased RES	Improved knowledge of the latest HVAC solutions and their potential deployment

Stakeholder type	Role	Current market barriers	Future desired change	Drivers to support the CBF
			deployment, enforcement of clean energy policies and actions	
Funding bodies	Provide funding for installations and pilot projects	Projects with “standard” energy performance and lack of innovative and ambitious investment projects	More advanced energy efficiency or RES projects leading to better energy and financial savings; new business and financial models	Development of new partnerships and business models; development of capacities of the market participants to implement advanced projects

3.2. Partner-specific stakeholder engagement plans

3.2.1. LEI

Main target groups for engagement

LEI seeks to involve various target groups whose activities are related to energy transformation and sustainability. The main groups include municipal energy specialists, representatives of regional development agencies, energy-related associations, teachers and students of higher education institutions, teachers of vocational education institutions, training centers, as well as representatives of non-governmental organisations active in the fields of climate change, energy, building construction and renovation. It is also important to involve representatives of equipment manufacturers and suppliers and the business sector, especially those working in energy, construction, and technology.

Specific Institutions to Address

LEI plans to cooperate with such institutions as the Association of Lithuanian Municipalities, Kaunas University of Technology, Lithuanian College of Engineering, Kaunas Technical Training Centre, as well as with the Lithuanian Energy Agency, the Environmental Project Management Agency, the Lithuanian Thermal Engineering Association, and the Lithuanian Heat Suppliers Association. These institutions are strategically essential to disseminate the project results and ensure their practical application.

Communication Channels

For communication with stakeholders, LEI will use various channels: face-to-face meetings and seminars, online events (webinars), newsletters, social networks (LinkedIn, Facebook), and project and LEI websites. Partner networks and professional associations will also be used to expand reach.

3.2.2. EAP

Main target groups for engagement

EAP will engage in a two-fold way: in first place with umbrella organizations to reach out to specific companies and workers, and second, with extended group of non-professionals – municipal representatives and students at technical universities. The aim of the CBF will be in first place to develop further the skills of operating professionals and to also upskill non-professionals and equip them with knowledge and skills to seek integration of advanced heat pump technologies in their ongoing projects.

Specific Institutions to Address

EAP has cooperation with umbrella organizations related to building construction, system installers, and HVAC and RES associations. EAP intends to closely collaborate with Bulgarian

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Construction Chamber, Chamber of Architects in Bulgaria, Bulgarian HVAC Association, and Chamber of Installation Specialists in Bulgaria, so that CBF information is distributed among their members and potential workers apply to the programme. In addition, discussions with the Technical University of Plovdiv and University of Plovdiv (Faculty of Physics) will be held to offer the CBF to their students as extended learning programme to their regular activities. High schools students from two technical schools will be invited to join within their "twinning" school practice. Finally, EAP will invite municipal experts from the Construction and technical departments from Municipality of Plovdiv and other municipalities in Plovdiv Region to upgrade their knowledge on heat pump integration in buildings.

Communication Channels

EAP will promote the CBF through direct emailing to the professional associations and their members and also to municipal experts. EAP will develop an online communication campaign to further promote the training and publicize its overall run. Publications in technical media will be prepared to announce the start of the CBF and recruit other participants. The trainings may also be conducted along other activities of the professional associations to gain further audience.

3.2.3. EUROTRAINING

Main target groups for engagement

The primary target group for stakeholder engagement are professionals in the building and energy efficiency industries, particularly HVAC installers, mechanical engineers, energy performance consultants, and RES system designers. Additionally, EUROTRAINING will target municipal energy officials and local authorities who are interested in sustainable urban development. Secondary target groups include VET educators, NGOs focusing on climate resilience and energy poverty, and university students studying engineering and environmental sciences.

Specific institutions to address

EUROTRAINING would like to engage with the Technical Chamber of Greece (TEE), the Centre for Renewable Energy Sources and Saving (CRES), and relevant departments from institutions such as the National Technical University of Athens (NTUA) or the Aristotle University of Thessaloniki (AUTH). Key professional associations such as the Hellenic Association of Mechanical and Electrical Engineers (HAMEE) and the Hellenic Institute of Refrigeration could also be approached. We also intend to connect with municipalities that have declared climate neutrality targets, such as Athens and Thessaloniki.

Communication channels for engagement

Direct outreach at industry events, formal letters, and targeted emails will be used to establish initial communication. To introduce the project scope and encourage cooperation, introductory info sessions can be planned. EUROTRAINING will use email lists and virtual meetings for

continued collaboration. Workshops and in-person site visits can be planned to sustain participation and encourage capacity building in line with the project's goals.

3.2.4. NOVEL GROUP

Main target groups for engagement

NOVEL GROUP SARL will focus on engaging stakeholders active in the sustainable construction, energy efficiency, and renewable energy sectors. Primary groups include vocational education and training providers, SMEs involved in HVAC and RES installations, innovation and technology hubs, energy service companies, and professionals transitioning into the heat pump sector. NOVEL also aims to engage umbrella organizations representing workers and businesses, municipal authorities, and chambers of commerce.

Specific institutions to address

Key institutions for engagement include the Luxembourg Chamber of Trades, MyEnergy Luxembourg (national energy agency), House of Training (Chamber of Commerce), CNFPC (national vocational training centre), and the Ministry of Energy and Spatial Planning. Collaboration is also sought with local branches of international energy firms and innovation incubators, such as Technoport.

Communication channels for engagement

NOVEL will employ targeted outreach through email introductions and LinkedIn for first contact, followed by online meetings. For ongoing work, NOVEL will rely on bilateral phone calls, and participation in sector-specific events. Stakeholders will also be engaged through co-hosted training sessions and pilot site visits.

3.2.5. UMA

Main target groups for engagement

UMA will try to engage future professionals and active workers in the heat pump sector and related sectors. Our main targets are students of vocational training schools and university students in mechanical engineering-related fields, as well as gas, HVAC, and PV installers. The trainings can actually be tailored to the specific needs of the receptors. In addition, UMA aims to involve educators and training providers to ensure the sustainability and dissemination of the knowledge gained. By focusing on both newcomers and experienced professionals, we hope to bridge the skills gap and support the growing demand for qualified personnel in the heat pump industry.

Specific institutions to address

UMA will mainly contact vocational schools in different parts of Spain, professional associations (for installers and engineers), companies that answered the surveys of WP2, and the national

and local employment services. These institutions represent key entry points to reach both students and professionals already active in the sector. UMA believes their involvement will be essential for effectively promoting and implementing the training activities.

Communication channels for engagement

The communication channels will mainly be personal contacts, such as phone calls and direct emails, as well as general email outreach. For ongoing operational work, UMA will rely on the teaching platform used for CBF delivery.

3.2.6. RGS

Main target groups for engagement

RGS targets professionals from the renewable heating and cooling sector, (RHC) with a particular focus on shallow geothermal and heat pump technologies. Key stakeholder groups include HVAC installers, energy auditors, building engineers, and system designers. Secondary target audiences include students (bachelor, master, PhD) from technical universities in energy-related fields, trainers from vocational education and training (VET) providers, and staff from public institutions responsible for energy efficiency and climate action programmes.

Specific institutions to address

RGS will first engage with its own members, both individuals and legal entities, operating in fields directly or indirectly connected to RHC technologies. Further outreach will include technical universities such as the University Politehnica of Bucharest, the Technical University of Cluj-Napoca, and the University of Oradea. Private sector engagement will focus on HVAC companies, RES system integrators, and technology providers active in the Romanian RHC market.

Communication channels for engagement

Initial contact will be established via direct emails, formal letters of intent, and dedicated stakeholder webinars. Engagement will be reinforced through participation in national energy-related events, technical roundtables, and co-organised workshops. Ongoing communication will be maintained through monthly online meetings. Where relevant, on-site activities such as demonstration visits and technical exchange sessions will be used to strengthen stakeholder collaboration and maintain alignment with the objectives of the Capacity Building Framework (CBF).

3.2.7. ADEPORTO

Main target groups for engagement

AdEPorto intends to engage with key target groups to strengthen human resource capacity in the field of heat pump and support a healthy growth of sector. The main groups include local

authorities and public entities, to foster collaboration on sustainable energy and climate objectives, as the heat pump sector has high potential to contribute to decarbonization and energy efficiency. Educational and vocational training institutions will be engaged to promote skills development and lifelong learning in areas such as HVAC, renewable energy, and energy efficiency. AdEPorto will also work with industry associations and professional bodies to ensure that training aligns with the evolving needs of the heat pump market. Furthermore, AdEPorto seeks to involve private companies, particularly SMEs (small and medium-sized enterprises) active in the heat pump sector, to support technological innovation and workforce qualification. Community organizations and citizens in general will be encouraged to participate in raising awareness and promoting the adoption of energy-efficient solutions. Cooperation with national funding bodies will be crucial to mobilize resources that drive the upskilling of professionals and the sustainable development of the heat pump sector.

Specific institutions to address

Several Portuguese entities were identified in Deliverable D2.2, where AdEPorto foresaw potential for engagement to achieve the project goals and ensure impact beyond the project's duration. Vocational schools and training centres should be prioritised, along with professional associations representing businesses, installers, engineers, and architects. These entities should serve as key starting points for promoting the CBF project and related training activities to students, professionals seeking to acquire skills in the field, and those wishing to update their knowledge.

Communication channels for engagement

Direct emails and phone calls should be the starting point for reaching specific targets to promote the teaching platform used for CBF delivery. If necessary, online meetings can be arranged to explain the platform's goals, demonstrate how it works, outline its main objectives, and offer support.

Table: 4 Stakeholder and communication matrix

Stakeholder	Communication theme	Engagement approach	Engagement tool	Frequency
Umbrella/branch organisations	*Support for inclusion of trainees in the training*	*Regular meetings, online/phone communication*	*Online/phone* *Live meetings*	*Online/phone – Weekly* *Live meetings – Monthly*
Private sector companies	*Support for inclusion of trainees in the training; demonstration technologies and sites*	*Live meetings, discussions*	*Live meetings*	*Live meetings – Monthly*

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Stakeholder	Communication theme	Engagement approach	Engagement tool	Frequency
Technical high schools, universities	*Participation of their students in the trainings; common lecturers/trainers*	*Live meetings, Online/Phone communication*	*Online/phone Live meetings*	*Online/phone – Weekly Live meetings – Monthly*
Training institutions (VOC)	*Participation of their students in the trainings; common lecturers/trainers*	*Live meetings, Online/Phone communication*	*Online/phone Live meetings*	*Online/phone – on demand Live meetings – on demand*
Public Institutions	*Participation of their experts in the trainings*	*Online/Phone communication*	*Online/phone*	*Online/phone – Monthly*
Funding bodies	*Support for identification of private companies*	*Online/Phone communication*	*Online/phone*	*Online/phone – Monthly*

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4. Monitoring and evaluation

The preparation and execution of the CBF is to be monitored for achieving its objectives and thus ensuring that it will result in improved knowledge and skills for all trainees. The monitoring and evaluation framework (M&E) suggested aims to define metrics to track the success of the CBF and provide grounds for its further adjustment. The proper monitoring of the CBF ensures that potential issues are identified and addressed in a timely manner and adjustments are made to improve the CBF. The aim is to establish a reliable monitoring approach to continuously assess the effectiveness of CBF training sessions and adjust them when needed.

The M&E suggests quantitative and qualitative indicators, units, and regularity of monitoring to be deployed by each partner in general and for each CBF session.

In order to evaluate the knowledge gained, skills acquired, and mentees' confidence in applying what they've learned, pre- and post-training assessments will be conducted. The CBF will be evaluated through feedback forms for each session to collect mentees' opinions on various aspects of the CBF, include questions about the content, delivery, organization, and overall experience. Items to be included in the post- training survey may be rate the quality, relevance, and delivery of the CBF content and open-ended questions that allow participants to provide detailed feedback, suggestions for improvement, and insights on how they plan to apply what they've learned.

As the monitoring and evaluation approach is crucial to track and assess the implementation of the project objectives, four different approaches will be deployed:

- **Statistics** kept by the partners through the numbers of involved practitioners during the CBF implementation,
- **Assessment survey** to determine the pre- and post-level knowledge levels of the attendees,
- **General feedback** through open-ended, interview-like questions for evaluation of their experience and opinion on the CBF,
- **Satisfaction survey** with close-end questions on a scale to measure the satisfaction levels of the trainees with the CBF.

The monitoring and evaluation will be made on general level of CBF implementation as well as session-specific level according to the KPIs in the following tables:

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Table: 5 General level monitoring and evaluation indicators

M&E indicators	Qualitative / Quantitative	Units
Total number of sessions (live/online)	Quantitative	Number
Total number and type of attendees	Quantitative	Number
Total number of unique organisations whose workers/employees joined	Quantitative	Number
Types of organisations that joined the CBF	Qualitative	Free text
General feedback form on the CBF implementation (open-ended questions; interview-like)	Qualitative	Free text
Satisfaction survey (close-end; scale questions)	Quantitative	Scale

Table: 6 CBF training-specific monitoring and evaluation indicators

M&E indicators	Qualitative / Quantitative	Units
Number of attendees (live/online)	Quantitative	Number
Number of unique organisations	Quantitative	Number
Types of background	Qualitative	Free text
Pre- and post-training survey	Quantitative	Scale

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