Interreg Alpine Space

Co-funded by the European Union

ALPHA

D.1.2.1

Analysis of needs and business opportunities for h&c smes and services providers

Executive Summary

The present report presents the results of the online survey implemented within the framework of Activity A1.2 of the ALPHA Project. In the Alpine Space region, the integration of heat pumps and renewables into DHC is lagging. Bottlenecks include the lack of dedicated financing and policy measures, the lack of skills development and training schemes for optimal retrofitting pathways for older infrastructure, as well as the fragmented processes for DHC planning and implementation. During Activity A1.2, ALPHA partners utilised a set of questionnaires, developed by TREBNJE, to document the existing technological, financial, and skills-related challenges and needs of SMEs and individual service providers in the HCC sector in their regions are confronted with. They also assessed the feasibility and impact of different business models and collaboration schemes to the innovation capacity of SMEs and individual service providers.

The results of the analysis highlight how cash flow challenges and limited funding opportunities coupled with the labour market's skills gap in emerging professions specialised in 5GDHC, significantly inhibit the ability of SMEs and individual service providers to invest in advanced solutions and increase their service offering to become involved in large scale projects for the construction and expansion of regional low and ultra-low temperature district heating and cooling networks. Feedback from SMEs and individual service providers from partners' regions, received through a dedicated online questionnaire, verify partners' input.

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INTRODUCTION

The ALPHA project brings together nine (9) partners from five (5) Alpine Space EU countries - IT, FR, DE, AT, SI – to transnationally coordinate and accelerate the adoption of 5th Generation District Heating and Cooling (5GDHC) solutions in Alpine Space. ALPHA aims to increase stakeholders' capacities across all planning levels, including businesses, to overcome existing barriers and collaboratively plan, pilot test, and replicate common 5GDHC network pathways for the Alpine heating and cooling (HCC) sector.

Small and medium enterprises (SMEs) play a crucial role in the development and modernisation of district heating and cooling (DHC) networks. These decentralised systems rely on a variety of SME actors for construction, operation, and maintenance. Key service providers include building contractors, installers of heating and cooling components, and companies specialising in integrating renewable energy sources (RES) into DHC systems. Additionally, HCC network owners, consulting firms, and engineering companies contribute significantly to the modernisation efforts. Beyond direct involvement, business support organisations, industry associations, and energy communities also play vital roles in advancing DHC systems.

SMEs bring flexibility and regional expertise, allowing them to adapt quickly to new market demands and technologies. They also stimulate local economies by creating jobs and fostering collaborations with larger companies and research institutions, driving innovation and progress in the HCC sector.

In the framework of the ALPHA project, the Slovenian partner, Municipality of Trebnje (TREBNJE), leads Activity A1.2 where ALPHA partners utilised an online tool to map the technological, financial, and skills-related needs of SMEs and service providers from the broader HCC sector in their territories, as well as document suitable business models and collaboration opportunities towards ecosystem development. Project partners also invited regional SMEs and individual service providers in their regions, to participate in a

complementary online survey regarding the challenges they face in expanding their service offering to be involved in the modernisation of regional district heating and cooling networks.

ALPHA Partners			
Lombardy Foundation of the Environment (IT)	FLA	Technical University of Munich (DE)	TUM
Liguria Region (IT)	LIGURIA	Austrian Society for Environment and Technology (AT)	OEGUT
Eurac Research (IT)	EURAC	European Center for Renewable Energy Güssing Ltd. (AT)	EEE
National Institute of Applied Science-Lyon (FR)	INSA-LYON	Municipality of Tebnje (SI)	TREBNJE
Chamber of Commerce and Industry of Nice Côte d'Azur (FR)	CCI NCA		

RESEARCH METHODOLOGY

AIM OF THE RESEARCH

Within the scope of Activity A1.2, the aim of this research was to map the technological, financial, and skills-related needs of SMEs and service providers in the broader HCC sector within the Alpine Space. Additionally, the research aimed to document suitable business models and collaboration opportunities that can foster ecosystem development in the region. By identifying both the needs and opportunities of SMEs and individual service providers, the results of this research will inform policies designed to support their innovation and competitiveness. Ultimately, this will contribute to the modernisation and sustainable development of the DHC sector in the region.

DATA COLLECTION TOOLS

The data collection tool used in this research consisted of three online questionnaires designed to gather detailed information from ALPHA project partners, as well as SMEs and individual service providers in the DHC sector in the Alpine Space:

Questionnaire on Technological, Financial, and Skills-Related Needs (QNR I): It aimed to guide partners in identifying the specific technological challenges, financial constraints, and skills gaps faced by SMEs and service providers. It included questions on technological advancements needed, investment capabilities, access to financing, training needs, and workforce skills.

Questionnaire on Suitable Business Models and Collaboration Opportunities (QNR II): It aimed to guide partners in documenting emerging business models and potential collaboration

opportunities that can enhance the innovation and competitiveness of SMEs and service providers. It included questions on interest in new service-based models, potential for public-private partnerships, and opportunities for collaboration with research institutions and industry consortia.

Questionnaire for SMEs and Individual Service Providers (QNR III): It was designed to gather direct feedback from SMEs and individual service providers on the same issues covered in the other two questionnaires. It aimed to capture their perspectives on technological, financial, and skills-related needs, as well as their views on suitable business models and collaboration opportunities.

RESULTS'ANALYSIS PER ALPHA REGION / PARTNER

OVERVIEW OF COLLECTED DATA

In the compulsory questionnaires, QNR I and QNR II, all but one project partner (INSA Lyon, FR) submitted their input.

Access to advanced heating system components, such as high efficiency heat pumps, and the integration of RES, such as solar, wind, geothermal, and biomass into existing district heating networks are the two factors that 75% of partners (6 out of 8) identified essential for regional SMEs and individual service providers to remain competitive. Additionally, more than half of the partners (5 out of 8) indicated that the **digitalisation of heating and cooling systems** to optimise operations is an emerging challenge for regional SMEs and service providers. Similarly, half of the partners emphasised the need to **improve the capacity of civil servants** in matters related to 5GDHC network planning as essential to accelerate the integration of SMEs and individual service providers in HCC modernisation and expansion in their regions.

Regarding key financial barriers impeding the growth of SMEs and individual service providers in the heating and cooling sector, all but one partners (88%) highlighted **limited access to funding**. In addition, 66% of partners (5 out of 8) identified **cash flow management challenges** as significant financial constraints for regional SMEs and service providers. Overall, partners emphasised the need for **policy support** promoting the transition to 5GDHC, either by directly covering high upfront costs for businesses and homeowners through dedicated funding schemes or by launching project calls for such upgrades that encourage the participation of SMEs.

In terms of labour market challenges for regional SMEs and service providers in the heating and cooling sector, almost all partners (7 out of 8) identified the **lack of skilled technicians** specialised in modern HCC technologies and materials used in 5GDHC systems. Similarly, 66%

of partners (5 out of 8) pointed out the **lack of professionals** with required level of digital literacy to support the digitalisation of operation of DHC systems. Additionally, 75% of partners (6 out of 8) referred to the challenges faced by SMEs and service providers in **staying updated with the evolving regulatory framework** pertaining to DHC network design, construction, and operation.

Regarding suitable business models that could be adopted by regional SMES to advance their role in the transition to sustainable and efficient HCC systems in their regions, most partners identified **subscription models**, as the most easily adopted by SMEs in their region. These models, where customers pay a fee for ongoing services, are also expected to offer the greatest potential for fostering loyalty and long-term engagement with customers. However, partners noted that **Energy Performance Certificates (EPCs)** are expected to be more easily accepted and preferred by customers, despite being relatively difficult to implement and posing significant risks to maintaining customer relationships. Lastly, partners indicated that a fee-for-service business model, where customers only pay for specific services as needed (such as repairs, maintenance, or system upgrades), offers the greatest potential for long-term revenue for SMEs in their region. Still, they do not consider it to be the preferred by customers, given the availability of other models like subscription services and EPCs.

Partners were also asked to evaluate the potential and suitability of different collaboration schemes for advancing the innovation capacity and competitiveness of SMEs in the heating and cooling sector in their region. They highlighted that regional SMEs have the potential to offer their services in **symbiotic systems**, such as integrating recovered waste heat from regional and local sources into DHC networks. This approach offers SMEs the opportunity to tap into a niche market and strengthen their expertise in sustainable solutions. Additionally, partners believe that **partnering with technology providers** and participating in **industry networks and associations** can offer SMEs new networking opportunities and access to cutting-edge solutions.

Note: regions are identified using the (NUTS 3, NUTS 2, Country) code schema, as per the ALPHA project Application Form.

BOLZANO/BOZEN, PROVINCIA AUTONOMA DI BOLZANO/BOZEN, ITALIA (EURAC)

The climate of the region of Bolzano/Bozen varies through the province, from alpine to subcontinental, with warm and variable summers and colt and quite snowy winters. Decentralised and bi-directional 5GDHC can be particularly advantageous for the region, as they operate in near- ground temperatures which reduces thermal losses and improves overall system efficiency.

Scalers are defined here as SMEs with at least 10 employees that grow in employment or turnover at an average annual rate of more than 10% over a three-year period. (OECD, 2024)

The region hosts and attracts a dynamic population of scalers. Around one in nine SMEs in the province is an employment scaler, and more than one in six is a turnover scaler. However, the contribution of the fastest-growing scalers is lower than in the rest of Centre and North Italy. This is in part due to the sectoral specialisation of scalers in the region who are concentrated in less knowledge intensive services, such as health, education and social activities. In these sectors there are typically fewer high-growth scalers than in knowledge intensive sectors such as medium-high tech manufacturing.

According to EURAC **the primary challenges that regional SMEs in the heating and cooling sector face are related to the advanced technological aspects of 5GDHC networks**, mainly the high- efficiency heat technologies that can operate efficiently at lower temperatures and specialised digital systems for optimising the control of diversified heat sources, including the integration of recovered low-temperature waste heat from commercial buildings. Properly including and managing multiple renewable and waste heat is crucial for the feasibility of 5GDHC.

Providing regional SMEs and individual service providers with **financial tools**, such as targeted funding initiatives to cover the very high initial investment costs is pivotal for their ability to penetrate the 5GDHC market in the region, according to EURAC. Promoting the participation

of SMEs in state- funded projects for advanced energy solutions through tailored project calls could be an effective. Alternatively, establishing funding schemes for homeowners and businesses to cover the upfront cost of upgrading their HCC systems could be equally effective.

EURAC highlighted the need for financial support to be complemented by **upskilling and reskilling initiatives** in the region targeting SMEs, service providers but also civil servants involved in the construction and operation of DHC networks (infrastructure services, permitting departments, etc.). Staying updated with the evolving regulatory framework pertaining to DHC network design, construction, and operation can be challenging for both professionals and civil servants. Designing and regularly implementing specialised upskilling programmes for the labour force working in the construction of 5GDHC networks and the upgrade of existing DHC networks (e.g., heat pump installers) is acknowledged as paramount for accelerating the integration of SMEs and individual service providers in the modernisation and expansion of 5GDHC systems in the Province of Bolzano/Bozen. Similar training in technical requirements related to recent EU legislation affecting DHC systems could also help SMEs and individual service providers build confidence in this technology, particularly those involved in the operation of DHC networks.

Considering the different business models that are widely employed by business in the heating and cooling sector, EURAC highlighted the **suitability of EPCs to incentivise SMEs** to ensure high performance and energy efficiency, as their revenue is directly tied to the outcomes achieved. EURAC noted that subscription models with fixed fees are less suitable as they do not promote energy savings and thus do not align with the climate and energy goals of the region. Similar concerns were raised about fee-for-service business models, which, although quite common for conventional district heating, might not be suitable for 5GDHC, where an important cost component is the electricity used to run heat pumps, and it is not obvious how to price the exchanged water.

Additionally, EURAC highlighted the potential of engaging in symbiotic systems to enhance the innovation capacity and competitiveness of SMEs in the HCC sector. Particularly agreements between SMEs and sources of low-temperature waste heat, such supermarkets and

pharmacies, where here SMEs perform the technical work to integrate waste heat into the district heating network, are considered to align with the characteristics of DHC in the region. This also provides incentives for SMEs to invest in the innovative technologies.

Scaling Up in Trentino – Alto Adige / Südtirol, OECD, 2024

SÜDBURGENLAND, BURGENLAND, ÖSTERREICH (EEE GMBH)

The region of Burgenland's climate blends continental and mild maritime influences. Summers are warm, while winters can be quite cold, though extreme cold spells are less common compared to Austria's alpine regions. Burgenland is a leader in renewable energy, particularly wind power. The region has invested heavily in wind farms and other renewable energy projects, contributing to its goal of energy self-sufficiency. SMEs in the region have an active role in renewable energy projects, and there are initiatives in place to support them, including mentoring programs and training opportunities to help them transition to more sustainable business practices. However, there is still a need for further development, particularly in the development of circular business models.

According to EEE, **the current operational framework of district heating grids in Südburgenland (South Burgenland) imposes significant barriers to the integration of SMEs and individual service providers** in the DHC market. Existing district heating networks are operated by local biomass associations, which are also responsible for network maintenance and selling heat to private and commercial customers. This framework leaves little room for external involvement. EEE noted that the ongoing digitalisation of district heating systems could potentially offer opportunities for SMEs to be involved in the installation, maintenance, and possibly even operation of advanced digitalised systems. However, such actions would need to be supported by **tailored project calls** for upgrading and digitalising existing district heating networks that encourage or require the participation of SMEs.

Another key characteristic of the region is its significant history in district heating systems. However, as these systems are quite old, there is a need to improve the knowledge of associations involved in their operations and maintenance. This includes modernising the

biomass district heating grids and collecting consumption data to create user profiles in order to improve the services and products offered. These **skill-related needs create opportunities for SMEs to gain access to the DHC market** in the region by offering skilled technicians specialised in modern HCC technologies and materials used in 5GDHC systems, professionals with digital literacy to support the digitalisation of DHC system operations, and experts in modelling DHC systems.

To this end, EEE emphasised that Südburgenland is fertile ground for SMEs that provide consulting and business insights services, such as modelling peak demand hours and creating details used profiles. EEE underlined that the **collaboration of SMEs with RGD institutions and universities** could lead to the creation of innovative solutions that could be then commercialised and implemented in the DHC sector, giving SMEs a competitive advantage in an old and outdated regional district heating sector.

Forschung Burgenland GmbH, 2024

ALPES-MARITIMES, PROVENCE-ALPES-CÔTE D'AZUR, FRANCE (CCI NCA)

The Provence-Alpes-Côte d'Azur is one of the warmer regions in France due to its Mediterranean climate that characterises its coastal areas. However, inland and at higher elevations, such as the Alps, the climate shifts to a mountain one with cooler temperatures and significant snowfall in the winter. According to the National Institute of Statistics and Economic Studies (INSEE), the region is characterised by a strong presence of SMEs of less than 500 employees, which represent 93% of local businesses, including micro-enterprises employing fewer than 10 people[4]. Within the heating and cooling sector, the presence of SMEs and individual service providers is limited. As on-going projects to modernise or develop new urban heating and cooling networks as large-scale, with SMEs primarily involved as subcontractors rather than being the main contractors.

CCI NCA emphasised the need for **technical and technological investments to strengthen the role of SMEs and individual service providers** in the modernisation and expansion modern HCC systems in the province. They (SMEs and individual service providers) should invest in advanced heat pump technologies that operate efficiently at low temperature as well as specialised technologies and systems to support the diversification of energy supply of DHC systems, including the integration of renewable energy sources.

Regional SMEs also face significant **challenges in securing the necessary financial resources** to undertake DHC systems upgrade and development independently. According to CCI NCA, these challenges stem from inefficient cash flow management approaches and the increasing certification costs required for components of modern DHC systems. For SMEs to grow and gain market access in the development of large-scale projects, they must maintain strong financial stability while securing regular payments from their clients. Additionally, frequent changes in standards impose significant costs, posing risks to their financial stability. By reducing the financial barriers for customers to upgrade their HCC systems, SMEs can tap into new markets. This includes both residential and commercial sectors that may have previously been unable to afford such upgrades. As more customers invest in advanced systems, SMEs can expand their customer base and increase their market share.

However, **public authorities need to invest in regional upskilling and reskilling programmes** for both SMEs and individual service providers, as well as civil servants in key functions related to project of upgrading district heating networks. A well-trained workforce that is well versed in modern technologies and systems of digitalised and decentralised 5GDHC networks, makes SMEs more attractive to clients and investors. This, in turn, improves their service offerings and enhances their competitive advantage, facilitating market expansion and generating additional revenue. Additionally, skilled professionals can better navigate regulatory changes, secure funding, and identify effective collaboration opportunities to gain access to state-of-the-art technologies.

To this end, the subscription model, where customers pay a regular fee for an ongoing service, is indicated by CCI NCA as the most suitable for regional SMEs It provides a steady income that

allows SMEs to invest in new technologies and services, enhancing their offerings over time. In addition, technology partnerships of SMEs with industry experts and innovative start-ups, can allow regional SMEs to gain access to cutting-edge technical solutions without the need to invest heavily in RCD, while also allowing for the exchange of best practices to improve their adaptability to market demands and strengthen the ability to meet evolving regulatory and sustainability requirements.

INSEE, 2022

MILANO, LOMBARDIA, ITALIA (FLA)

The Region of Lombardy (Lombardia) is one of the cooler regions in Italy characterised mainly by a central European climate of cold winters and warmer summers. In the northern part of Lombardy, the Alps experience a colder mountain climate with significant snowfall, while summers are cooler. Statistics SMEs constitute the backbone of the region's productive fabric, accounting for more than 99% of Lombardy's businesses[5].

Similar to the Province of Bolzano/Bozen, decentralised and bi-directional 5GDHC can be particularly advantageous for Lombardy, as they operate in near-ground temperatures which reduces thermal losses and improves overall system efficiency. For SMEs to become involved in upgrading existing district heating systems and constructing new modern ones, they need to **invest in upgrading their technological profile**, as highlighted by FLA. This includes acquiring advanced technical knowledge and technologies such as low-temperature heat pumps, as well as digital solutions to facilitate remote control and streamline the operation of networks that integrate diverse intermittent sources of heat (renewable energy, waste heat from industrial and commercial buildings).

However, regional SMEs and service providers in the DHC sector often face **significant financial barriers**. The most common challenges relate to securing financing and subsidies needed to support sustainable energy investments and the uptake of new technologies. Additionally, SMEs tend to lack managerial and financial resources that allows them to efficiently manage their cash flow and limited budget to engage in collaborations with

research institutions working on advanced energy solutions and heating and cooling technologies. FLA acknowledged the need for state financial incentives that will provide regional SMEs with microloans and grants to invest in operational upgrades and maintain strategic RCDCI collaborations.

Moreover, FLA emphasised the need for **targeted reskilling and upskilling programmes** for the region's technical and management workforce to equip the with the latest knowledge and skills needed to implement and maintain advanced DHC systems effectively. Additionally, the training programmes should offer up to date insights to the technical requirements relate to EU legislation affecting DHC systems, such as the F-gas regulation.

Considering the different business models that could advance the role of SMEs in the region of Lombardy, FLA noted that **EPCs are beneficial to both SMEs and clients**, incentivising both parties towards achieving optimal system performance and energy savings. However, EPCs require considerable financial resources for SMEs to cover the high upfront cost of constructing or upgrading district heating systems, which in most times they lack. Adopting a fee-for-service model on the other hand provides SMEs with opportunities to offer a range of services, generating income from various service offerings. It is also a concept widely and easily accepted by customers allowing them to pay only for the services they need.

In addition, acknowledging that entrepreneurship in Lombardy is both widespread and dynamic, showing a regional trend towards innovation, development, and technology, FLA highlighted the benefits of **SMEs joining industry networks and associations** to share knowledge, best practices, and market opportunities. They can also benefit from opportunities to collaborate with other companies in the sector, gaining access to innovation and financing opportunities.

INTER VENTURES Project, 2020

MÜNCHEN, LANDKREIS, OBERBAYERN, DEUTSCHLAND (TUM)

The climate in the region of Oberbayern (Upper Bavaria) is quite diverse due to its varied geography, which includes the Alps in the south and lower-lying areas in the north. On average the region experiences a continental climate with cold winters and warm summers, but local climatic conditions are influenced by its distance from the sea and proximity to the Alps. Bavaria's traditionally strong SME sector, SMEs are just as successful in rural areas as they are in urban settings, covering a wide range of sectors from industry, commerce, crafts and trades, tourism, the services industry, and freelance professions.

Many SMEs in Oberbayern work alongside municipalities in the planning of district heating network upgrades. Municipalities in the whole of Bavaria need to provide a Heat Transformation Plan in the next 2-3 years, which they expect to implement with co-funding from the regional or national government to tackle the significant upfront investment. However, **SMEs lack the skilled workforce** to efficiently support the planning of 5GDHC networks. TUM identified **capacity gaps in civil servants** in national, regional, and local authorities to handle the regulatory complexities of modern DHC systems, including evolving public funding programs for new HCC networks, as well as lack of technicians skilled in modern HCC technologies and materials used in 5GDHC systems. Enhancing the digital, planning, and technical skills of SMEs in the HCC sector in (Upper) Bavaria is acknowledged by TUM as pivotal in allowing SMEs to gain market access and expand their service offerings to municipalities. Additionally, TUM **highlighted the importance of state funding schemes for business owners and homeowners to cover the investment costs** of implementing upgrades to 5GDHC systems.

For those SMEs involved in the construction, operation, and maintenance of district heating and cooling networks, TUM identified **subscription models as the most suitable for the Bavarian economy** and district heating and cooling sector. These models have a comparatively low financial risk, allowing SMEs to have good control and planning of cash flow management. Regarding the advancement of SMEs' innovation capacities, TUM suggested that collaboration with **RGD institutions** can have the highest impact for Upper Bavarian SMEs. They highlighted, however, that RCD activities require an open-minded mindset, which from experience, they

say only a small fraction of SMEs possess for research collaboration with universities and research centres.

Bavarian Representative Office Worldwide, 2024

GENOVA, LIGURIA, ITALIA (LIGURIA)

The region of Liguria is generally characterised by a warm climate, though variations occur. In coastal areas winters are mild and summers are warm but not excessively hot. In inland areas, the climate becomes cooler due to higher altitude of the hills and mountains. Similar to the other Italian partner regions, decentralised and bi-directional 5GDHC are highly a highly suitable option for Liguria. For SMEs though to be involved in the market of modern DHC systems, they need to overcome a series of technological, financial, and skills related barriers.

Ligurian SMEs have a long tradition and have thus established a strong customer base, who tend to have greater trust in local SMEs than in large corporates because they former are established in the region. However, **local SMEs struggle to keep up with the technological advancements** of modern HCC systems, as well as the evolving regulatory framework pertaining to DHC network design, construction, and operation. Although regional authorities are actively promoting and financially supporting the adoption of advanced technologies and digital services among SMEs, LIGURIA suggests that SMEs in the HCC sector can benefit from more targeted action. State funded training programmes should focus on energy efficiency targets and existing options for the decarbonisation of district heating systems. In addition, there is an evident skills gap in the labour force working in the construction and maintenance of district heating systems, according to LIGURIA. Specialised upskilling programmes for technicians are needed enhance their skills and knowledge regarding state-of-the art technologies and innovative materials used in 5GDHC systems.

Moreover, LIGURIA stressed the **significant market challenges** faced by regional SMEs in the HCC sector, as they face complex regulations and procedures to access funding along with unsustainable financial guarantees and interest rates. Both these factors affect the cash flow and financial stability of SMEs and hinder their ability to innovate and gain market access. Simplified and streamlined procedures of funding applications need to be coupled with targeted initiatives for SMEs to promote the digitalisation of their operations and improve their service offerings in line with the requirements of modern DHC networks, as noted by LIGURIA. In addition, funding schemes should also target businesses and homeowners that wish to upgrade their district heating systems, covering fully or partially the high upfront costs of such projects.

LIGURIA highlighted that enhancing the skills of SMEs regarding technical, regulatory, and financial aspects of 5GDHC networks will also allow them to upgrade their role in regional markets by transitioning to more sustainable business models, such as EPCs. At the moment, a great share of SMEs lacks the legal and technical expertise to adopt EPCs, including defining the terms of the contract and modelling of consumptions and savings, according to LIGURIA.

Considering the above challenges and needs of Ligurian SMEs, LIGURIA also pointed out that **technology partnerships can be highly advantageous for SMEs** while enhancing the regions innovation capacity. Partnering with companies specialising in advanced energy efficient technologies (e.g., low temperature heat pumps, digitalised control systems, condensing boilers, etc.) will allow SMEs to improve their service offerings without the need to invest in RCD, in turn enhancing their competitiveness.

Piano Transizione 5.0, 2025

JUGOVZHODNA SLOVENIJA, VZHODNA SLOVENIJA, SLOVENJA (TREBNJE)

The region of Jugovzhodna Slovenija (Southeast Slovenia) has a varied climate, with its Alpine Region experiencing cooler temperatures than lower areas and temperatures often dropping

below freezing in higher elevations. As in the rest of Slovenia, SMEs in its southeastern region constitute the backbone the regional economy, however they lag behind in the adoption of advanced technologies, including digitalisation.

Within the DHC sector, SMEs in Southeast Slovenia are mainly involved in the installation of heating and cooling components, such as heat pumps, solar systems, and heating, ventilation, and air conditioning (HVAC) systems. A small number also offer consulting services to private customers (households) interested in upgrading to low-temperature heating and cooling systems (4GDHC).

To increase their competitive advantage against large companies in the HCC sector, regional **SMEs need to digitalise their operations and invest in advanced technologies** (e.g., low temperature heat pumps, smart thermostats, etc.). However, according to TREBNJE, they face **significant financial challenges** to secure the necessary capital for participating in RCDCI projects, investing in large scale district heating upgrade development projects, and expanding their service offerings. TREBNJEE pointed out that project calls for advanced energy solutions promoting the participation of SMEs in development projects could be a key driver of SMEs integration in the heating and cooling sector.

Similarly, **specialised upskilling programmes for technicians** along with **regular training of employees in managerial and operational roles** on the regulatory framework affecting DHC systems, are equally important to drive regional entrepreneurship and SMEs' innovation capacity. TREBNJE also highlighted the need to **improve the capacity of civil servants** in matters related to 5GDHC network planning as essential to accelerate the integration of SMEs and individual service providers in HCC modernisation and expansion in the region.

Considering the existing limited capacity of SMEs in the HCC sector in Southeast Slovenia along with the challenges they face upscaling their service offerings, TREBNJE suggested **subscription models as both long-term sustainable and feasible for adoption by SMEs**. These models provide SMEs with a steady flow of revenue, allowing them to make long term financial plans and invest in advanced technological solutions. For similar reasons, TREBNJE indicated

that SMEs could significantly benefit from **engaging in symbiotic systems**, providing their services for the integration of waste heat from industrial facilities, such as Melamin chemicals, in municipal district heating networks.

European Commission, 2024

WIEN, WIEN, ÖSTERREICH (OEGUT)

The region of Wien (Vienna) experiences cold winters with frequent snowfalls and mildly warm summers. Temperatures occasionally drop well below freezing, especially in the Alpine parts in the west of the region. Within the Austrian economy, SMEs account for more than 99% of all businesses. They differ however according to their size and industry.

The Vienna Heat Plan 2024 outlines the city's strategy for replacing the city's 600,000 currently installed gas heating systems with renewable energy alternatives by 2040. The plan considers all buildings in the urban area and identifies where it is possible to expanding district heating, referring to a centralised heating system which efficiently serves multiple buildings.

According to OEGUT, in order to be able to replace existing high-temperature district heating systems in Vienna with (ultra) low-temperature ones in a cost-effective and minimally invasive way requires complex planning and a high level of technical expertise. For example, a great number of buildings must be thermally retrofitted, installing a centralised pipe system to all flats and a low temperature heating system. Additionally, to utilise the region's geothermal potential and increase the district system's energy supply diversification and sustainability, borehole drillings in the buildings' courtyards are recommended.

These conditions create a range of challenges for SMEs and individual service providers active in the HCC sector in Vienna. Firstly, access to high-efficiency heat pumps and advanced drilling systems is essential for the rollout of 5GDHC networks. Particularly in densely built-up urban areas, borehole drilling can cause considerable burden and noise disturbance in the neighbourhood. Additionally, most companies offering drilling services employ diesel-powered machines. In line with Vienna's decarbonisation goals, OEGUT highlights the importance of transitioning to electrically powered drilling systems, which also need to be smaller in dimension to be used in areas of limited space such as building courtyards.

Transitioning to 5GDHC systems requires significant financial investments, much of which needs to be provided upfront. As the transition includes interventions to residential buildings, OEGUT points out the lack of cash flow SMEs and individual service providers face, which impedes their ability to invest in advanced technologies as well as support the feasibility and planning studies needed for engaging in the retrofitting of residential buildings. For example, OEGUT indicates that a technical and financial offer for the retrofitting of the district heating system of four residential buildings in Vienna incurs a preparation cost of around 50,000 euros, which is a significant financial risk for SMEs as they are not sure they will secure the deal with the clients. To tackle these financial challenges, OEGUT highlights the effectiveness of funding schemes addressed to businesses and homeowners wishing to upgrade their buildings' existing HCC systems (connected to the district heating system). Providing end-users with funding to cover the upfront costs of the renovation makes them more likely to invest, which includes the offer and planning costs SMEs will charge them.

SMEs in Vienna also face a lack of skilled personnel in both technical and operational fields of 5GDHC networks. For example, an emerging method for installing central heating pipe networks to all flats of a building is through the buildings' chimneys. However, this requires installers skilled in the technique, which are lacking in the region according to OEGUT. Moreover, SMEs do not have the human resources (42% of total SMEs being one-person enterprises) to keep up with the changing regulatory environment, including the technical requirements affecting modern DHC systems. OEGUT stressed that specialised upskilling

programs for the labour force working in the construction of 5GDHC networks and the upgrade of existing DHC networks need to be a priority for regional authorities.

Another characteristic of the DHC market in Austria is the citizens' preference to introduce components to the buildings' district heating and cooling system that increase the self-efficiency of heat supply in their homes, such as geothermal boreholes. To this end, EPCs are quite attractive to customers, as a forward-looking service offering where the economic and technical risk is taken by the contractor (SMEs). As the region transitions to 5GDHC networks, OEGUT indicates that subscription models will become a more attractive option for both end-users and SMEs engaged in the operation and maintenance of the networks.

Federal Ministry of Labour and Economy, 2025

Stadt Wien, 2024

RESULTS' ANALYSIS PER VALUE CHAIN PART

The analysis of the needs and opportunities for SMEs and individual service providers (hereafter, stakeholders) per value chain part within the heating and cooling sectors based on the input received by regional SMEs and service providers in the Alpine territories through the online QNR III. A total of 20 submissions were received, 15 from SMEs and 5 from individual service providers. However, geographically, input was received from 3 of the 5 ALPHA partner countries: 11 entries from Italian stakeholders, 7 entries from Austrian stakeholders, and 2 entries from Slovenian stakeholders. Figure 1 presents in further detail stakeholders' input received in QNR III.

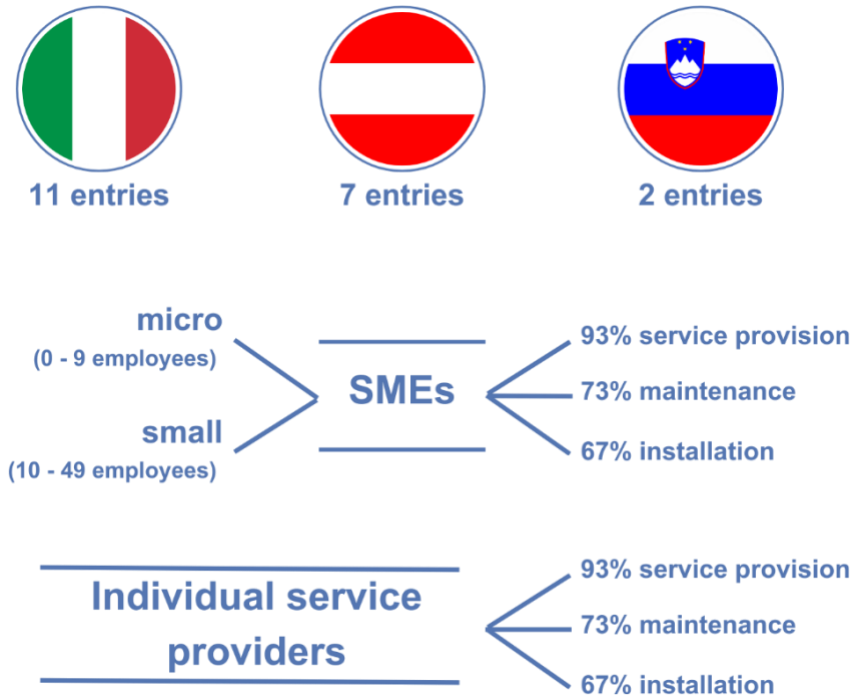

Figure 1: Identity of the stakeholders' survey

It must be noted that that none of the respondents are engaged in the manufacturing of HCC system component. Both stakeholder groups (SMEs and individual service providers) tend to

offer a **range of services, often covering both the installation and maintenance of HGC systems**. The majority of SMEs (93%) and individual service providers (80%) are also engaged in the provision of services, such as consulting, and development of digital tools for controlling and consumption monitoring of DHC networks.

There was a consensus between SMEs and individual service providers that the primary challenges they face relate to complexity the installation and maintenance of 5GDHC systems entail. Both stakeholder groups pointed out that the integration of RES and low temperature waste heat, requires the acquisition of costly advanced equipment (e.g., high efficiency heat pumps, hybrid thermal storage units, etc.) as well as highly skilled technicians to proceed with the installation and maintenance of such components. However, both highlighted that a set of **financial barriers** and the **regional labour market's skills gap**, factors that inhibit their ability to upgrade their service offers in line with the demands of modern district heating and cooling systems.

Two thirds of the SMEs (67%) and almost half of the individual service providers (40%) stressed the **complex procedures in accessing the limited funding options available** for covering upfront costs of upgrading of existing heating and cooling networks to 5GDHC. Moreover, the **lack of skilled technicians** specialised in advanced heating and cooling systems was pointed out by all respondents from both groups. Emphasis was placed not only on highly specialised workers for installation and maintenance of the systems, but also on the **labour market lacking planning experts for 5GDHC**, which requires the integration of advanced mechanical components with IT hardware (e.g., sensors, remote control systems, etc.).

Particularly, the **Italian stakeholders**, 90% of whom are engaged in the maintenance of heating and cooling networks, emphasised that the technical schools in their region do not offer up to date curricula corresponding to the current technical and theoretical needs for professionals in the heating and cooling sector. They also emphasised that educational institutions (universities and vocational training centres) should collaborate with industry leaders to ensure curricula are up to date with the latest trends and technologies. This includes

internships, apprenticeships, and job placement programs, which at the moment are limited in their regions.

Another important remark is that stakeholders, irrelevant of the part of the value chain they operate in and the country they are based, referred to **need for the regulatory framework to be adapted,** keeping up with the technological advancements of 5GDHC systems. Regional or National Laws, such as the Tenancy Law, the Condominium Law and the Heating Costs Billing Act in Austria, need to be adapted to enable the economic operation of 5GDHC networks and promote the decarbonisation of building sector. Similar remarks were made regarding the financial tools available for individuals (i.e., clients) that wish to invest in upgrading their building's HCC system in line with regional efforts to transition to low and ultra-low temperature DHC systems. There are **limited schemes that cover, at least the majority, of the upfront costs** of such investments. And as both individuals and the SMEs do not have the needed capital, the projects do not move forward, further delaying the region's decarbonisation.

When asked about the most suitable and promising business models that they consider having the highest potential to advance the role of SMEs in the modernisation and expansion of HCC network in their regions, the vast majority of stakeholders favoured the **fee-for-service model for its practicality and ease of selling in a competitive market**, taking into account the current energy market status, along with the existing framework of regulatory support and the costs of upgrading and maintaining 5GDHC systems. Stakeholders pointed out that fee-for-service models provide customers with clear and predictable costs and services.

Moreover, stakeholders also emphasised **subscription models as most promising for creating stable customer bases and predictable costs** within the framework of modernised 5GDHC networks. Some of the Italian stakeholders however highlighted a significant challenge: the prices for spare parts needed for maintenance and repair often do not have fixed prices, as they are set by each manufacturer. This variability makes it difficult for (Italian) SMEs interested in offering subscription services to accurately calculate service charges for their

clients, as costly spare parts' prices might change without notice, a concern particularly noted by Italian stakeholders.

Energy Performance Contracts (EPCs) was also identified as an appealing model, particularly for smaller 5GDHC systems, as pointed out by most **Austrian stakeholders**. EPCs remove technical risks and upfront costs from building owners by transferring them to SMEs performing the system upgrade, offering a comprehensive service that is highly attractive to customers.

Additionally, the analysis of stakeholders' responses revealed diverse opinions on the most effective collaboration opportunities to enhance the innovation capacity and competitiveness of SMEs in the heating and cooling sector. **Technology partnerships were deemed the most suitable** for SMEs' current needs, financial and technological capacity, and the existing energy market in partner territories. Particularly, Italian stakeholders highlighted the benefits of collaborations between DHC network companies and IT service companies, emphasising the importance of mutual exchange of benefits and skills.

Symbiotic systems were frequently pointed out as pivotal for project realisation, notably by Slovenian and Austrian stakeholders. Stakeholders emphasised the importance of building robust networks to manage the complexity of decision-making in planning and implementing a low- temperature DH system, especially in multi-party settings. They also pointed out the advantage of symbiotic systems in allowing energy to be sold at lower prices and creating greater added value for the SMEs involved.

Public-private partnerships (PPPs) with were also identified as suitable by some stakeholders, especially **for the integration of RES in 5GDHC networks**. In this context, collaborations with planners were highlighted as crucial to reduce complexity. However, Austrian stakeholders pointed out that in some cities, city-owned energy utilities dominate the market, making PPPs less requested by public entities. Additionally, they expressed concern that SMEs' skills may be overwhelmed by the complexity and bureaucracy inherent in this type of partnership.

Lastly, industry-academia partnerships were noted as offering the highest potential to enhance innovation and competitiveness by facilitating technology transfer, research and development (RCD), and workforce upskilling. However, the vast majority of stakeholders pointed out the **difficulty SMEs face in accessing industry-academia partnersh**

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Co-funded by the European Union

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