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UNIVERSITY OF
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Report

Activity A 3.3

Interregional workshop on improving strategic heat planning through the use of ICT tools

December 2025



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Executive summary

This report synthesises the outcomes of the Green4HEAT thematic workshop, hosted by the University of Patras, which brought together project partners and external stakeholders to explore the role of ICT tools in strategic heating and cooling planning. The workshop was structured in two main sessions: the first focused on regional presentations outlining current planning practices, challenges, and priorities in deploying green heating and cooling systems; the second examined a range of ICT tools, from open-access platforms for early-stage planning to advanced digital twins and smart building controls.

Participants engaged in in-depth exchanges on the usability, effectiveness, and applicability of the tools presented, both through structured roundtables and open discussion. Key lessons emerged around the need for better coordination between existing platforms, more tailored tool selection based on planning purpose and scale, and stronger support for municipalities in adopting and operationalising digital instruments.

The workshop demonstrated that ICT tools can support more data-informed, flexible, and resilient planning practices. Yet it also underscored the importance of governance, institutional capacity, and shared knowledge frameworks to ensure that such tools translate into real territorial impact. This deliverable summarises the main contributions of the event, reflects on their policy relevance, and identifies potential directions for strengthening the role of ICT in decarbonising Europe's heating and cooling systems.

Introduction

The Green4HEAT A3.3 workshop, held in Patras on June 18, 2025, brought together regional stakeholders and technical experts to examine the potential of Information and Communications Technology (ICT) tools for supporting strategic planning in the heating and cooling (H&C) sector. The event formed part of Work Package A3.3 of the Green4HEAT project and was designed to address the growing need for digital decision-making support systems that can enable municipalities and territorial authorities to plan, simulate, and manage sustainable thermal energy solutions.

With an emphasis on replicability and territorial application, the workshop combined the presentation of regional planning experiences (Session 1) with demonstrations of existing ICT platforms and tools (Session 2). These contributions were followed by a structured roundtable discussion, during which participants assessed the relevance and usability of the tools in relation to their own planning challenges.

The workshop aimed to create a shared understanding of how digital tools—particularly those that are open-source, modular, or tailored to specific planning needs— can help unlock the uptake of renewable and waste heat sources, improve system design and optimisation, and support long-term energy transition objectives. This summary report reflects on the main contributions and lessons learned during the workshop, with a focus on the usability and strategic value of ICT tools in the context of territorial H&C planning.



Workshop agenda

Co-funded by the European Union Green4HEAT		WORKSHOP Improving strategic heat planning through the use of ICT tools
Date: Wednesday, June 18, 2025		
09:00 – 09:30	Arrival and Registration	
09:30 – 09:45	Welcome & Workshop Overview <i>University of Patras</i>	
09:45 – 11:30	Session 1: Strategic Heat Planning	
09:45 – 10:00	“Introduction to Strategic Heat Planning ” <i>Eirni Stergiou, University of Patras</i>	
10:00 – 11:30	Partners Presentations (60’): Status of strategic heat planning and challenges of local authorities in partners ’ regions <i>All project partners (~ 7 minutes per partner)</i> Roundtable Discussion (30’): “Paths to overcome the challenges for strategic heat planning” <i>Moderation: UPAT</i>	
30’ Coffee Break		
12:00 – 16:00	Session 2: ICT tools for improved Strategic Heating Planning	
12:00 – 12:30	“The use of ICT tools for improved Strategic Heating and Cooling Planning: The case of Hotmaps” <i>Lukas Kranzl, Vienna University of Technology & Giulia Conforto, e-think [online, includes Q&A session]</i>	
12:30 – 13:00	“Smart Systems for the Utilization of Renewable and Waste Heat for Cooling and Energy in Industry” <i>Nikolopoulos Nikolaos, Centre for Research and Technology Hellas [online, includes Q&A session]</i>	
90’ Light Lunch Break		
14:30 – 16:00	Partners Presentations (60’): Existing and available planning, designing, and simulation tools for DH planning in partners ’ regions <i>All project partners (~ 7 minutes per partner)</i> Roundtable Discussion (30’): “How such tools can facilitate DH planning” <i>Moderation: UPAT</i>	
16:00 – 16:15	Conclusions & wrap-up <i>University of Patras</i>	
20:30	Dinner	

Participant Feedback and Reflections

Feedback collected through structured evaluation forms revealed a consistently high level of satisfaction with the workshop's organisation, content, and delivery. Participants uniformly rated the event's facilitation, thematic relevance, engagement opportunities, and logistical arrangements as excellent (5 out of 5). These responses reflect both the professionalism of the hosting team and the perceived utility of the workshop for participants' ongoing work.

Beyond general satisfaction, participants highlighted key thematic insights. A recurring challenge identified across responses was the lack of accessible, reliable, and granular data—particularly concerning building conditions, energy consumption, heat network configurations, and renewable resource availability. This data deficit, they noted, hampers long-term planning, limits the effectiveness of strategic decisions, and poses difficulties for aligning investments with decarbonisation goals.

ICT tools discussed during the workshop were viewed as essential instruments for addressing these gaps. In particular, GIS-based tools and energy demand mapping platforms were singled out as especially beneficial, allowing planners to integrate multiple data layers—land use, building performance, infrastructure, and resource potential—into comprehensive territorial assessments. Tools such as Hotmaps were described as valuable for initial stages of planning, while digital twins¹ and scenario-based modelling tools were acknowledged for their advanced capabilities in simulation and operational optimisation.

Participants also underlined the need for harmonisation in the use of and practical understanding of the insights provided by planning tools, pointing to the diverse levels of familiarity and capacity among stakeholders. They welcomed the workshop as an important step toward shared understanding and called for continued knowledge exchange and joint experimentation to build confidence in digital planning methods and support their institutional uptake.

¹ A digital twin is a digital model of an intended or actual real-world physical product, system, or process (a physical twin)

Main Contributions and Participant Perspectives

The first session of the Green4HEAT workshop, hosted by the University of Patras, laid the groundwork for exploring the strategic role of ICT tools in district heating and cooling planning (DHC). Structured around seven presentations from participating partners and external experts, the session provided a comparative overview of current practices, obstacles, and territorial governance structures shaping heat and energy transitions. What emerged was a complex picture of uneven institutional capacity, infrastructural diversity, and regulatory misalignment — but also a shared recognition of the value of digital tools in overcoming these challenges. The following summary outlines the main contributions of each speaker and highlights key insights from the session’s open discussion.

The session opened with a framing presentation by Eirini Stergiou of the **University of Patras**, who provided a structured introduction to the concept and practice of strategic heat planning. She described it as a systemic and phased approach to achieving resilient and efficient district heating (DH) systems that align with national climate and energy goals. The process involves three core stages: establishing a baseline scenario by mapping current heat demand, resources, and infrastructure; developing future technical scenarios that account for socio-economic, technological, and environmental trends; and detailed planning of district heating networks, including topology, temperature regimes, and integration of smart technologies. Stergiou underlined five major challenges that partners across Europe face: fragmented or unavailable data on existing infrastructure and sustainable heat sources, the difficulty of forecasting demand and renewable output, the complexity of designing new or upgraded networks, and the uncertainty around aligning intermittent renewables with network needs. She suggested a variety of digital and procedural tools to address these issues, from digital twins and machine learning diagnostics to scenario-based simulations and collaborative heat mapping platforms.

The first partner presentation came from Charalambos (Babis) Chrysochoidis, representing the **Region of Eastern Macedonia and Thrace** in Greece. He focused on a flagship geothermal project in the municipality of Alexandroupolis, the first in the country to apply geothermal energy for both urban and rural district heating. Located in the Aristino geothermal field, which spans 120 square kilometres with certified fluid temperatures reaching 99°C at only 500 meters depth, the project is designed in multiple phases to serve over 1,500 residents, 600 homes, municipal buildings, and potentially local greenhouses and the nearby airport. Chrysochoidis detailed the project timeline, highlighting the complexity of administrative approvals, funding procurement, and contractor selection over more than a decade. The first phase of the network, completed in 2024, supplies 11 public buildings, yet only utilises about 10% of the available geothermal capacity. While technical parameters are promising and preliminary economic analyses point to high feasibility —with projected heat costs significantly lower than conventional fuels— the speaker stressed that broader uptake hinges on attracting private investment, expanding end-user connections, and completing an updated feasibility study. The project, he concluded, offers an important case about how local authorities can harness geothermal potential, though long-term success requires structural and market alignment.

Next, Esther Biermans from the **Province of Antwerp** presented the situation in Flanders, Belgium, where sustainable heat remains a significant gap in the energy transition. Despite a strong planning

framework and the presence of large urban centres like Antwerp, renewable heat currently covers only a small fraction of regional demand. In response, Flanders has mandated that all municipalities develop “local heat plans” by 2030. These consist of a heat zoning map, identifying the most appropriate technology (district networks vs. individual solutions) for each area, and a heat policy plan outlining municipal actions to realise this vision. Biermans drew attention to the challenges municipalities face in implementing these plans: lack of access to reliable data on waste heat and building-level consumption (due to both privacy constraints and industry non-cooperation), limited time and capacity among municipal staff to familiarise themselves with existing tools, and insufficient technical knowledge to interpret available datasets. Despite these issues, 13 of the region’s 68 municipalities have already completed their plans, and many more are progressing. Tools such as the “heat zoning inspiration map” and “heat zoning start analysis” are being used to guide planning, but require contextualisation and integration with local data to be effective.

Representing Latvia’s **Vidzeme Planning Region**, Edgars Augustiņš offered insight into the structural and institutional fragmentation that complicates regional heat planning. Vidzeme includes 11 municipalities, each with its own energy policy and multiple district heating providers — over 23 regulated ones and several smaller, informal networks serving a handful of buildings. While 80–85% of district heating systems use woodchips, a locally sourced biomass, natural gas still plays a role, particularly during peak demand. Augustiņš highlighted several systemic challenges: the ownership mix (with increasing private ownership of DH networks), low building renovation rates, mismatches between modernised production units and outdated or oversized distribution systems, and limited investment in network upgrades or monitoring systems. Decision-making around network planning remains highly localised, with little coordination between municipalities. There is a pressing need to strengthen regional cooperation, digitise data collection (which is still largely manual), and build capacity to enable a shift towards electrified and more efficient district heating systems. A memorandum signed in 2024 to promote electrification marks a step in this direction, but much groundwork remains.

In Poland, according to Krzysztof Żarna of the **West Pomerania Region**, local authorities are formally responsible for energy planning under national law, but in practice lack the resources, incentives, and authority to carry it out effectively. In Szczecin, the regional capital with a district heating network covering 90% of the city, heat is still largely coal generated. Although municipal strategies promote decarbonisation and thermal renovation, implementation depends on the private companies that own and operate the system. Żarna emphasised the structural disconnect between policy ambitions and operational control. He also noted the dominance of coal and natural gas in heat generation across the region, the slow pace of renewable uptake (geothermal remains underexplored, with exploratory drilling planned only for 2027), and consumer preferences that prioritise affordability over sustainability. He called for regulatory reform to give local governments more power to shape energy systems, alongside clearer financial incentives for decarbonisation and consumer education campaigns to shift perceptions.

Rafael Ayuste Cupido, from the energy agency **EREN in Castilla y León**, Spain, discussed how his region developed a comprehensive strategy to promote renewable thermal energy as early as 2017.

The work was based on systematic market segmentation, quantification of demand, and policy design, but the strategy was never formally adopted. Today, the region is revisiting and updating this work within the Green4HEAT project. Ayuste described efforts to reassess thermal demand, model alternative 2030 scenarios, and identify targeted public policies aligned with financing realities. He underscored the need for technical, economic, and environmental evaluation of each measure, and cautioned against both ideological rigidity and narrow administrative approaches in policy design. He concluded by stressing the importance of serious monitoring and control mechanisms to ensure that future strategies remain responsive to evolving sectoral conditions.

Turning to Hungary, Imre Nagy of **Pannon Novum** described a national policy framework that is supportive on paper but leaves municipalities with substantial implementation burdens. The National Energy Strategy and National Energy and Climate Plan 2021-2030 aim to halve natural gas use in district heating and double geothermal output by 2030. Yet local governments lack a dedicated regulatory framework for thermal planning, as well as the technical expertise and financial resources to lead these transitions. Data access remains a major issue, and many municipal authorities have only a limited understanding of the energy systems they are meant to steer. Nevertheless, Nagy showcased several successful initiatives—including in Kaposvár, Szeged, Miskolc, Győr, and Mosonmagyaróvár— where municipalities have pursued ambitious geothermal integration, sometimes achieving substantial CO₂ reductions. These successes demonstrate what is possible when local leadership, technical expertise, and adequate funding align.

The final presentation in the session was given by Akvilė Jagučanskytė from Lithuania's **National Regions Development Agency**. She described a mature and well-regulated heating sector, where municipalities are legally required to develop 10-year heat development and investment plans aligned with national strategies. District heating is widespread, supplying about 76% of urban buildings and over half of total heat consumption, with over 85% of the fuel mix now composed of woody biomass and renewable municipal waste. Lithuania is also exploring geothermal as a future resource, with projects planned in Klaipėda and Gelgaudiškės using novel deep-well technologies. Jagučanskytė also noted the absence of district cooling networks and outlined the structural limitations that make their deployment viable only in buildings already equipped with central ventilation. Still, Lithuania offers a compelling example of how clear governance frameworks, strong municipal planning obligations, and early renewable integration can foster a coordinated and sustainable heat transition.

Overview of ICT Tools Presented

Building on the challenges identified in the territorial snapshots of Session 1, the second part of the Green4HEAT workshop turned its attention to the digital tools available to address them. Through a series of technical presentations, participants were introduced to a diverse array of ICT platforms developed under EU research projects or deployed across European municipalities and regions. These tools span various applications—from strategic planning and techno-economic simulations to smart control systems and digital twins—and reflect a growing ecosystem of data-driven solutions for sustainable heating and cooling. What follows is a synthesis of the main tools presented, highlighting their functions, territorial relevance, and potential contributions to regional heat and energy transitions.

Citiwatts, CoolLIFE, and SAPHEA

The presentation on “*The use of ICT tools for improved Strategic Heating and Cooling Planning*”, delivered by **Giulia Conforto** and **Mostafa Fallahnejad**, departed from the originally scheduled focus on Hotmaps.² Instead, the speakers introduced and demonstrated three more advanced tools—**Citiwatts**, **CoolLIFE**, and **SAPHEA**—each of which builds on the foundations laid by Hotmaps and significantly extends its functionalities in line with evolving needs in strategic heating and cooling planning.

The session began with an overview of **Citiwatts**,³ an open-source platform developed under the OpenGIS4ET project. Conceived as a successor to Hotmaps, Citiwatts brings the tool to a higher technological maturity, improves calculation modules, and introduces new functionalities related to district cooling, mobility, and energy system flexibility. Mostafa Fallahnejad outlined the platform’s structure, highlighting its modular approach: users can map heating and cooling densities, project demand, identify viable district heating zones, and carry out economic assessments comparing centralised and decentralised supply scenarios. A key feature is its Excel-based scenario assessment tool, which enables early-stage evaluations using default or user-supplied data. While the platform is most useful for municipalities beginning their heat planning journey, it has already been pilot-tested in several European regions and remains freely accessible with extensive documentation and tutorials.

Building on this structure, **CoolLIFE**⁴ was introduced as a complementary tool dedicated to sustainable space cooling. Giulia Conforto explained that, unlike heating, cooling demand in the EU has surged rapidly over the past decade—necessitating planning tools that can model not only

² The project’s website can be found at <https://www.hotmaps-project.eu/>, while the tool and the wiki are available at <https://www.hotmaps.eu/map> and <https://wiki.hotmaps.eu/Home>, respectively.

³ Citiwatts’ can be found at <https://project.citiwatts.eu/>, while the tool and the wiki are available at <https://citiwatts.eu/map> and <https://citiwatts.github.io/wiki/welcome-page/>, respectively. Finally, presenters point to a Citiwatts YouTube eLearning channel: <https://www.youtube.com/channel/UCwYghGgiFBChxVHIjDQY5jw>.

⁴ The CoolLIFE project website is <https://coollife.revolve.media/>. The project comes with resources and reports (<https://coollife.revolve.media/resources/>) as well as a knowledge hub (<https://knowledgehub.coollifeproject.eu/>). Finally, the tool itself and the wiki can be found at <https://tool.coollifeproject.eu/map> and <https://coollife-project.github.io/wiki/>, respectively.

technologies but also behavioural interventions and passive measures. CoolLIFE incorporates modules to assess energy demand, user behaviour, economic feasibility, and demand-side management strategies (such as pairing cooling needs with solar PV generation). It also includes detailed mappings of relevant financial instruments and regulations at EU, national, and local levels. This dual emphasis on quantitative assessment and contextual policy resources aims to support the proactive integration of cooling into broader climate strategies.

The final tool, **SAPHEA**,⁵ focuses on unlocking the market uptake of geothermal energy within multivalent district heating and cooling systems. Sharing the same underlying interface as Citiwatts, SAPHEA enriches the platform with geological layers, economic modules for large-scale heat pumps, and a detailed module (Geophires) for estimating the potential of deep geothermal aquifers. The project also developed extensive background resources, including a catalog of pan-European spatial datasets, guidance on financing instruments, and a set of policy and stakeholder engagement recommendations. Particularly innovative is SAPHEA's educational component, which includes an interactive "gamebook" designed to introduce non-experts to the decision-making challenges of geothermal deployment in a playful but informative manner.

Taken together, these tools represent a coherent, open-access suite that expands the capabilities first introduced by Hotmaps, offering regionally adaptable, user-friendly platforms that integrate technical modelling with economic and policy dimensions. Within the context of **Green4HEAT**, they provide a concrete opportunity for participating regions to strengthen their capacity in strategic heat and cooling planning—supporting early-stage assessments, stakeholder engagement, and the identification of viable green energy pathways tailored to local conditions.

RE-WITCH

The second presentation in this part of Session 2, titled "*Smart Systems for the Utilization of Renewable and Waste Heat for Cooling and Energy in Industry*", was delivered jointly by **Panagiotis Lykas** of the Centre for Research and Technology Hellas (CERTH) and **Panagiotis Tsarchopoulos** of Pragma IoT. The presentation focused on the RE-WITCH Horizon EU project⁶ and the deployment of smart systems to recover and utilise low-temperature waste heat and renewable energy within industrial settings. The case study examined was the MIL OIL biodiesel and biogas production plant in Serres, Greece, where a comprehensive system of integrated technologies is being implemented to convert surplus heat from biogas-powered combined heat and power (CHP_ units and solar thermal collectors into usable cooling energy for the plant's operations.

At the heart of the project lies an absorption chiller system, designed to be powered by low-grade waste heat and supported by solar thermal input. The plant currently releases much of its available heat to the environment, but under RE-WITCH, it will divert this resource into cooling water streams

⁵ SAPHEA's single market uptake hub is at the link: <https://www.saphea.eu/>, while the tool and the wiki can be found at <https://saphea.hevs.ch/map> and <https://saphea-project.github.io/wiki/>, respectively.

⁶ RE-WITCH project's website can be found at: <https://ieecp.org/projects/re-witch/>. Relevant materials can also be found at the project's LinkedIn: <https://www.linkedin.com/showcase/re-witch/posts/?feedView=all>.

serving both the biodiesel and biogas production lines. Lykas explained that this setup includes heat recovery from the flue gases and cooling circuits of the three CHP units, solar thermal input with an aperture area of 150 m², and an absorption chiller capable of delivering both low- and high-temperature cooling loads. To optimise performance and support real-time operation, CERTH has developed a Digital Twin of the absorption chiller — a physics-based model trained on variable input ranges including hot water temperature, flow rate, and ambient conditions.

The Digital Twin tool is built using MATLAB/Simulink and is designed to interface with the plant's Supervisory Control and Data Acquisition (SCADA) system. It simulates chiller operation, forecasts performance metrics like cooling output and coefficient of performance (COP), and proposes control strategies for regulating flow rates, pressures, and cycle dynamics. These insights are essential not only for operating the chiller efficiently but also for coordinating the broader system, which includes digesters, CHP units, and thermal storage. CERTH has also integrated forecasting algorithms into the model, which predict ambient temperature, solar irradiation, and waste heat availability. These forecasts feed into a Decision Support System (DSS), helping operators select the optimal combination of heat sources and adjust settings to meet anticipated cooling demands.

Building on this technological backbone, Pragma IoT has led the development of a monitoring infrastructure and data platform for MIL OIL. Tsarchopoulos detailed how the PRAGMA IoT platform collects real-time data from a network of sensors—temperature, pressure, and flow meters—installed across the CHP units, digesters, and the cooling loop. The system supports dynamic dashboards, data analytics, and alerting mechanisms, and is designed to be fully accessible remotely. Importantly, the platform is integrated with the Digital Twin to support coordinated decision-making and operational control. The result is a robust architecture for smart industrial energy management, combining renewable integration, waste heat valorisation, and digital intelligence. As Tsarchopoulos noted in closing, this solution is not limited to industrial plants; the underlying platform is already being adapted for other domains, including maritime transport and urban applications.

In the context of Green4HEAT, the RE-WITCH pilot illustrates how advanced digitalisation, forecasting, and control strategies can significantly improve the utilisation of renewable and waste heat sources—offering practical insights into how industry-level solutions may inform territorial planning and support sustainable energy transitions across EU regions.

Partners' presentation

The second part of Session 2 focused on exploring the existing and available planning, design, and simulation tools for district heating planning across partner regions. It offered an opportunity for both institutional partners and external stakeholders to reflect on the digital instruments currently in use or under development, as well as the structural and regulatory conditions that shape their adoption. The session opened with a detailed presentation from **Dr. Giedrė Streckienė**, representing the **Vilnius Gediminas Technical University** in Lithuania, and was followed by a more critical reflection by **Krzysztof Żarna** of the **West Pomerania Region** in Poland.

Dr. Streckienė's presentation provided a comprehensive overview of the landscape of ICT tools employed in Lithuania to support DH planning. She grouped these tools into four main categories:

techno-economic calculation software, network hydraulic simulation platforms, digital twins and production simulation tools, and other supporting resources. Among the techno-economic tools currently in use, she highlighted **energyPRO**, widely applied by municipalities and DH companies for multi-unit energy system simulation and strategic planning, as well as **RETScreen**, **Hotmaps Dispatch Tool**, and the **EPSO-G P2X calculator**, which provide varying degrees of feasibility analysis, system modelling, and integration of Power-to-X and solar technologies. In terms of hydraulic simulation, Lithuanian planners rely on tools like **TERMIS** and **Leanheat® Network**, which enable pressure and temperature modelling across DH networks, with the latter tailored specifically for district energy systems.

Moving beyond classical simulation, Dr. Streckienė emphasised the emerging role of **digital twins** in Lithuania. While still at an early stage of deployment, companies such as Vilniaus šilumos tinklai and Kauno energija are exploring the potential of platforms like **Gradyent.ai** and **heatbeat**, which offer real-time virtual replicas of DH systems for forecasting, optimisation, and scenario analysis. She noted that the uptake of such tools is linked to broader digitalisation efforts in large utilities and the gradual integration of AI and real-time data streams into operational workflows. Complementary resources such as the **Heat Recovery Tool**, **THERMOS**, and **Hotmaps** were also mentioned, alongside platforms like **energis.It** and technology catalogues that provide data and decision support. In sum, Lithuania presents a maturing ecosystem of digital tools that spans both planning and operational phases, supported by participation in European R&D projects and increasing interest in digital twin applications.

By contrast, the situation described by Krzysztof Żarna in Poland —and more specifically in the **West Pomerania Region**— revealed a more limited and fragmented adoption of planning tools. Żarna opened with a candid admission: no dedicated ICT tools for strategic heat planning are currently in use in his region. He explained that while local authorities are legally responsible for energy planning, the regulatory framework does not provide them with the instruments or leverage needed to fulfil this role effectively. Ownership and operational responsibility lie largely with district heating companies — many of which are private— and their alignment with municipal decarbonisation strategies is often voluntary. As a result, most local authorities focus primarily on fuel switching and short-term affordability, with little capacity for forward-looking planning.

Nonetheless, Żarna pointed to two local-level exceptions that offer some inspiration. The first is the city of **Kraków**, which developed its own **Heat Map** in 2016 using the **QGIS** open-source platform. This tool was the product of collaboration between municipal authorities, local heating companies, and researchers from the AGH University of Science and Technology. It allows for the spatial forecasting of heat demand and supports planning decisions aimed at network expansion and investment risk reduction. The second example, from **Kielce**, is more rudimentary, consisting of a publicly accessible geoportal that overlays heating network data with basic infrastructure information. Żarna concluded by calling for a national campaign to raise awareness of available planning tools, legal reforms to empower municipalities in relation to DH companies, and external funding to enable the uptake and implementation of green heat strategies at the local level.

The third presentation of this session was delivered by **Ismael Lozano Gabarre** from **CARTIF Technology Centre** in Valladolid, Spain, and focused on improving strategic heat planning through the use of ICT tools. Lozano introduced a newly developed predesign tool for 5th generation district heating and cooling (5GDHC) networks, originally stemming from the REWARDheat project.⁷ This tool is not intended for final engineering design, but rather to assist energy companies and engineers in rapidly producing preliminary layouts for new district energy systems. Structured around three levels (project, scenario, and options) the tool first enables users to define a geographical study area anywhere in Europe through integration with OpenStreetMap, which automatically populates the map with building and street-level data. Users can then edit building-specific inputs such as construction year, heating system types, and domestic hot water demand to refine the model.

At the scenario level, planners define the spatial location and type of heat production systems (biomass, solar, geothermal), which the tool then connects to demand points through an automatically generated optimal network layout, minimising connection lengths. An embedded energy model estimates building demand based on both user inputs and local weather/radiation data, producing predesigns that include estimated flows and pipe diameters across the network. Finally, in the options level, users can tweak system characteristics such as pipe insulation thickness or installation depth to compare different configurations based on capital expenditure (CAPEX), operational expenditure (OPEX), or energy efficiency key performance indicators (KPIs). The tool drastically reduces predesign time and can support developers and municipalities in preparing early-stage project proposals for DH deployment. While not yet fully online in its current version, a demo from the original REWARDheat project remains available, with full European coverage depending on local data availability.

The fourth presentation was given by **Imre Győző Nagy** of **PANOV** and focused on the range of district heating planning, design, and simulation tools currently available and in use in Hungary. Although Nagy acknowledged some overlap with tools presented earlier, he offered a systematic comparison of ten key tools based on functionality, features, and applicability. These included widely used systems like **AD Net Heat** (Fraunhofer), which supports real-time DH network simulation via digital twin models, and **nPro Energy Planning Suite**, a web-based tool for designing and simulating energy systems with building-level load profiles. Open-source solutions such as **THERMOS** and **Leanheat® Network** were also highlighted, with the former supporting local authority planning and the latter enabling dynamic, real-time modelling of DH performance.

Other tools covered included the **RES-DHC Toolbox**, which guides local authorities through all phases of DH planning and decarbonisation; **GIS-based optimisation tools**, which leverage spatial data for strategic network layout; and **Open Energy Modelling Framework (oemof)**, an open-source library for complex energy system simulation. The list also featured tools focused on building-level energy performance and its integration into DH systems, such as **ECOCITIES**, **OpenStudio**, and **TRNSYS**, the latter used for simulating renewable energy integration and passive solar design. Nagy concluded that this broad suite of tools provides Hungarian municipalities with ample resources to

⁷ A demo of the initial version of the tool can be found at: <https://tools.cartif.es/rewardheat/#/TheProject>.

support low-carbon DH planning and emphasised the need for local authorities to be equipped and trained to fully leverage these capabilities.

The fifth presentation was delivered by **Elīna Strode**, Senior Project Manager at **Gulbene Municipality** in Latvia, who introduced a newly launched project titled “*Intelligent Management of Building Heat Supply*”, or more simply, *Wise Heating*. The initiative brings together nine municipalities and covers 44 buildings across the region, aiming to promote the development of smart municipalities by implementing a centralised system for smart heating control. With a total eligible budget exceeding €2 million, most of it EU-funded, the project’s goal is to achieve at least 10% thermal energy savings through the intelligent regulation of indoor temperatures based on building use patterns, energy prices, and external conditions.

Strode explained that the motivation behind the project lies in the increasing multifunctionality of municipal buildings, which house services with differing schedules and comfort requirements, such as kindergartens, administrative offices, and cultural centres. Current heating management practices—typically based on outdoor temperature alone—often result in overheating or underheating, particularly in transitional seasons like autumn and spring. Added to this are challenges such as volatile energy prices, manual inefficiencies, and a lack of flexibility in existing building management systems, which are typically designed for new constructions and require large investments.

The innovation at the heart of *Wise Heating* lies in the development of a centralised, self-learning AI platform capable of autonomously managing building temperatures. The system will analyse a broad array of input, ranging from real-time and historical climate data, user behaviour patterns, and energy prices, to solar radiation and PV output. Key features include the automated adjustment of room-specific temperatures, the ability to dynamically switch between different heat sources (such as electricity or pellets, depending on price), and the integration of ventilation systems. Importantly, based the system is designed to be applicable to existing buildings without requiring major renovations, making it especially suited to the municipal building stock. Finally, Strode noted that the project will follow an innovation procurement process, which will focus on performance- targets and open the field for diverse technological approaches, with the ultimate aim of demonstrating scalable, replicable smart heating solutions in public infrastructure.

The sixth presentation came from **Esther Biermans**, representing the **Province of Antwerp**, who outlined the ICT tools and mapping systems currently in use to support district heating planning in Flanders. As Biermans noted, despite growing attention to heating decarbonisation, the region remains underdeveloped in terms of district heating coverage. The province’s approach thus focuses on enabling municipalities to develop local heat plans, supported by a suite of geospatial tools and data platforms.

A central component of this toolkit is the “heat zoning inspirational map”, which visualises current and projected heat demand at the street level and identifies zones with sufficient heat density for economically viable DH deployment. Biermans explained that this tool allows local authorities to compare district heating with individual heat pump scenarios, both for current conditions and future projections (e.g. 2050). By estimating renovation impacts on demand density, the tool can inform long-

term infrastructure choices. An enhanced version of this instrument, the “heat zoning start analysis”, offers cost-based scenario comparisons between DH and building-level electrification options, helping to identify the most cost-effective pathways.

In addition to the zoning tools, Antwerp’s planning framework includes a layered mapping system that compiles building-level demand data (e.g. schools, hospitals, large housing blocks), industrial heat loads, and other key variables to support planning decisions. This granular mapping allows municipalities to locate promising anchor loads and strategically initiate network planning. Biermans also highlighted the use of **PathOpt**, a proprietary optimisation tool developed by VITO, which simulates the most cost-effective layout for DH pipelines by balancing factors such as source location, consumer density, and network length. While not open-source, PathOpt has been used in provincial projects involving geothermal energy to identify optimal infrastructure configurations.

Finally, Antwerp benefits from “Provinces in Numbers,” a shared provincial database compiling energy, emissions, and building stock data, among others. This platform provides local planners with an accessible repository of official data to support heat zoning, CO₂ monitoring, and long-term renovation strategies.

Together, these presentations demonstrated the expanding landscape of ICT-based tools for strategic heating and cooling planning across Europe. From advanced simulation platforms and geospatial heat mapping to AI-driven building-level optimisation systems, the session highlighted a wide array of digital solutions tailored to different territorial scales and technical needs. These tools not only accelerate predesign and planning processes, but also enable more adaptive, cost-effective, and data-informed decision-making. For participating regions in Green4HEAT, adopting and tailoring such tools offers a powerful means to enhance local energy planning capacities, identify viable investment opportunities, and align with broader climate and energy goals at regional and European levels.

Roundtable Reflections and Critical Assessment

The final part of Session 2 brought together Green4HEAT partners in a structured roundtable format to discuss the relevance, usability, and strategic application of the digital tools introduced throughout the day. Participants were divided into two in-person working groups —Belgium, Latvia, and Poland in one, and Spain, Hungary, and Lithuania in another—, while a parallel discussion was held online for remote participants. Each group was invited to reflect on three key dimensions: ease of use, effectiveness in addressing planning challenges, and the most relevant application(s) of each tool (e.g. simulation, forecasting, network optimisation, or system design).

Despite the diversity of regional contexts and technological readiness levels, several common themes emerged. The first group emphasised the urgent need for *integration rather than proliferation*. Their core suggestion was to move away from creating new platforms and instead concentrate on harmonising and connecting existing tools under a shared European framework. The participants argued that a centralised guidance mechanism —such as an EU-level contact point or “one-stop shop”— could provide tailored advice to local and regional authorities on which tool or platform best suits their specific circumstances. This would not only reduce confusion but also optimise the use of resources and promote interoperability.

The second group approached the question from a slightly different angle, focusing on *functionality, scale, and purpose*. They noted that no single tool can serve all planning needs: tools are purpose-specific, and their selection depends on the desired outcome. For simulation, one set of ICT tools might be most effective, for network design or optimisation, another. In this light, the group called for greater clarity around what each tool can actually deliver and proposed the development of a “functional matrix” to help planners navigate the complex digital landscape.

Effectiveness, they stressed, is not a static metric. It depends on the objectives set by planners and the parameters of success. Is a tool effective if it reduces emissions? Lowers heating costs? Enhances user engagement? Answers will differ depending on context. To that end, participants underscored the importance of aligning tool development with clearly defined performance metrics and policy goals. Moreover, the group called attention to a significant gap: while heating receives considerable digital attention, cooling remains relatively underexplored. The lack of ICT tools specifically dedicated to planning for district cooling, especially in a context of rising summer demand, was noted as a critical blind spot.

Finally, participants highlighted structural issues affecting tool uptake and implementation. Many public authorities are constrained by procurement rules, staff capacity, or limited budgets, which makes it difficult to adopt advanced planning software—even when available open-source. In contrast, more expensive proprietary tools may be out of reach for smaller municipalities. This tension between usability, affordability, and technical capacity reinforces the need for coordinated support, capacity-building, and funding at both national and EU levels.

In sum, the roundtable discussions added an essential critical lens to the technical presentations. While the tools introduced during the session offer promising functionalities and demonstrate



technological maturity, their practical deployment will depend on simplifying access, clarifying use cases, addressing gaps (especially around cooling), and strengthening institutional capacities for digital planning.

Key Lessons Learnt

The Green4HEAT workshop provided valuable insights into both the strategic potential and the practical limitations of digital tools for sustainable heating and cooling planning. As participants exchanged regional experiences, examined existing ICT platforms, and reflected on implementation challenges, several cross-cutting lessons emerged.

First, the value of ICT tools lies not merely in their technical sophistication but in their usability and contextual adaptability. Tools such as Citiwatts, CoolLIFE, and SAPHEA demonstrate outstanding modelling capabilities, combining geospatial, technical, economic, and policy layers into integrated platforms. However, their full value is only realised when accompanied by appropriate training, documentation, and institutional capacity to interpret and act upon results. This was especially evident in cases where public authorities lacked either the technical expertise or internal resources to navigate even open-access tools effectively.

Second, successful deployment of digital tools requires a clear articulation of planning needs and expected outcomes. The workshop revealed a broad variation in how effectiveness is defined, from cost reduction and carbon savings to stakeholder engagement or system resilience. This suggests that tool selection must be closely aligned with specific territorial goals and indicators. A more systematic typology of tools, linked to functions such as demand forecasting, network predesign, or techno-economic evaluation, could support better alignment between tool capacities and user needs.

Third, while digital innovation in heating is advancing, district cooling remains insufficiently addressed. Multiple partners expressed concern that current tools focus primarily on heat supply and demand, with little modelling capacity for cooling technologies, passive design, or thermal resilience in the face of rising summer temperatures. As cooling demand grows across Europe (especially in the context of climate adaptation), this asymmetry risks producing blind spots in planning. Future tool development must therefore place greater emphasis on integrating cooling dimensions, both technically and institutionally.

Fourth, structural fragmentation and regulatory complexity remain persistent barriers. Even where tools exist and are accessible, their uptake is often hindered by unclear mandates, limited inter-municipal cooperation, or competing planning responsibilities. As several presentations and discussions made clear, regional success stories tend to emerge where governance frameworks are supportive, data access is streamlined, and a shared planning culture is cultivated. ICT tools must be embedded within such enabling environments to have lasting impact.

Fifth, there is a clear demand among local and regional actors for more integrated guidance. Rather than proliferating new platforms, participants advocated for a unifying framework—possibly at the EU level—that could offer curated access, use-case recommendations, and long-term technical support. This would not only lower the entry threshold for smaller authorities but also foster greater standardisation, data interoperability, and cross-border learning.

Taken together, these lessons affirm the central role of digital tools in territorial energy planning but also highlight the importance of pairing them with institutional, regulatory, and pedagogical support.



For Green4HEAT regions, this means that digital innovation must be treated not only as a technical challenge but as a governance opportunity; one that requires coordination, trust-building, and sustained public investment.

Conclusion and Way Forward

The Green4HEAT workshop underscored the transformative potential of ICT tools for shaping more sustainable, integrated, and adaptive heating and cooling systems at the territorial level. Through a series of detailed presentations, practical demonstrations, and collaborative reflections, participants engaged with a wide array of digital solutions, ranging from strategic mapping and predesign platforms to real-time monitoring systems and AI-driven building management applications.

Across all sessions, a recurring theme was the need to move from ad hoc or reactive planning towards more anticipatory, data-informed, and systemic approaches. Whether through platforms like Citiwatts and SAPHEA that support early-stage scenario modelling, or through tools like Wise Heating that optimise building-level operations, the workshop highlighted the role of ICT tools in bridging the gap between planning ambition and operational capacity. At the same time, it revealed that tool adoption alone is insufficient unless matched by enabling governance structures, inter-institutional collaboration, and sustained capacity-building efforts.

Looking ahead, the project offers a strong foundation for continued regional experimentation and shared learning. Tools showcased during the workshop—especially those that are open-source, modular, and policy-aware—provide an accessible entry point for many regional authorities. But more than that, they can serve as catalysts for fostering a shared planning culture: one that is grounded in evidence, responsive to local conditions, and capable of navigating the complex trade-offs of the green transition.

Within this context, the Green4HEAT project can act as a connector between digital innovation and regional implementation. By promoting peer exchange, showcasing practical tools, and clarifying the policy relevance of ICT-based planning, the project opens up new pathways for municipalities and regions to accelerate the decarbonisation of heating and cooling systems.

While the final workshop presentations have now concluded, the conversation continues. As the project advances, future activities should build on the insights gathered here, supporting the co-development of toolkits, the identification of institutional bottlenecks, and the delivery of training and peer-support mechanisms. Such efforts will be essential to ensure that digital tools do not remain isolated solutions but become embedded components of territorial planning strategies.