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Building local partnerships for reducing the fossil energy demand of district heating systems in the Eastern Danube Region

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REHEATEAST – Building Local Partnerships for the Decarbonisation of District Heating in the Eastern Danube Region

The REHEATEAST project is a transnational initiative implemented within the Interreg Danube Region Programme, led by Pannon EGTC and involving 11 core partners and a wide network of associated stakeholders across the Danube Region. The project responds to a shared structural challenge: district heating and cooling (DHC) systems in the Eastern Danube Region are often outdated, inefficient, and heavily dependent on fossil fuels, resulting in high energy costs, energy poverty, and significant greenhouse gas emissions.

The overall objective of REHEATEAST is to reduce the fossil energy demand of district heating systems while increasing the integration of renewable energy sources and waste heat. To achieve this, the project aims to develop and promote scalable, adaptable solutions that address both supply-side and demand-side inefficiencies, while strengthening cooperation among key stakeholders involved in local energy systems.

A key premise of the project is that district heating modernisation cannot be achieved through isolated technical interventions alone. Instead, it requires coordinated action across multiple levels—technical, institutional, financial, and social. REHEATEAST therefore adopts a holistic and systemic approach, combining technological innovation with governance development, stakeholder engagement, and policy alignment.

At the core of the project lies the concept of building strong local partnerships. The project brings together municipalities, energy agencies, research institutions, utilities, and other actors to jointly develop solutions tailored to local conditions, while ensuring their transferability across the region. This multi-level cooperation is essential, as district heating systems involve a complex network of actors—from public authorities and energy providers to consumers, financial institutions, and technology suppliers.

One of the project's main innovation elements is its dual focus on both supply-side and demand-side transformation. On the supply side, REHEATEAST promotes the integration of renewable energy sources such as geothermal energy, biomass, and waste heat into district heating systems, alongside the application of digital tools, thermal storage solutions, and nature-based approaches. On the demand side, it addresses building-level energy efficiency, user behaviour, and consumption patterns, recognising that reducing heat demand is as important as decarbonising heat supply.

To operationalise these concepts, the project implements a series of pilot actions across multiple countries in the Danube Region. In total, eleven pilot actions are carried out, testing two main types of interventions: demand-side "community lab" processes and supply-side optimisation solutions. These pilots serve as real-life laboratories where technical solutions, stakeholder engagement methods, and governance models are developed, tested, and refined.

The demand-side pilots focus on understanding and unlocking efficiency potential at the end-user side of district heating systems. They deliver the analytical, technical and governance foundations needed for future demand-side investments. Activities include detailed energy audits and renovation scenarios for multi-apartment buildings, research on the regulatory, financial and social factors that shape the building retrofit market, prototype installations of demand-driven control and monitoring solutions at building and substation level, and digital tools that support informed decision-making by residents, building operators and municipalities.

In parallel, the supply-side pilots address the modernisation and decarbonisation of district heating systems through both technical interventions and strategic planning. They span the integration of renewable heat sources — geothermal energy, biomass, solar PV combined with heat pumps and electric boilers, and thermal storage — heat-loss diagnostics and reduction, digital monitoring and remote control of distribution networks, and the development of governance frameworks such as Heat Energy Communities. Together, these activities aim to create more flexible, resilient, and sustainable heating systems.

A significant methodological innovation of REHEATEAST is the development of two integrated solutions validated through pilot implementation. The first is a stakeholder-inclusive demand-side development model that supports energy efficiency improvements and addresses energy poverty. The second is a holistic supply-side optimisation framework that enables the transition towards low-carbon district heating systems. These solutions are designed to be transferable and adaptable, allowing other regions to replicate and scale the project's results.

Beyond technical implementation, REHEATEAST places strong emphasis on knowledge sharing and capacity building. The project facilitates transnational learning through workshops, professional exchanges, and dissemination activities, enabling partners to learn from each other's experiences and adapt best practices to their local contexts. This transnational dimension is critical, as many challenges related to district heating—such as outdated infrastructure, regulatory barriers, and financing gaps—are common across the region.

The project also contributes to policy development by formulating recommendations based on pilot results and stakeholder feedback. These recommendations aim to support more effective regulatory frameworks, financing mechanisms, and governance models at local, national, and European levels. In this way, REHEATEAST not only delivers practical solutions but also helps shape the broader policy environment for sustainable heating.

In terms of expected impact, the project contributes to multiple strategic objectives. It supports the reduction of greenhouse gas emissions, decreases dependence on imported fossil fuels, and enhances energy security in the Danube Region. At the same time, it promotes social and economic benefits, including reduced energy costs, improved living conditions, and increased resilience of local communities.

The project is also closely aligned with key European policy frameworks, including the REPowerEU plan and the Energy Efficiency Directive, reinforcing its relevance within the broader EU energy transition agenda. By addressing both climate and socio-economic challenges, REHEATEAST positions district heating as a central element of the transition towards a low-carbon and energy-efficient future.

In conclusion, REHEATEAST represents a comprehensive and forward-looking approach to district heating modernisation in the Eastern Danube Region. By combining technical innovation, stakeholder cooperation, and policy alignment, the project demonstrates how complex energy systems can be transformed in a practical and scalable way. Its integrated methodology—linking analysis, pilot implementation, and knowledge transfer—ensures that the results are not only locally relevant but also applicable across the wider European context.

Through its pilots, partnerships, and strategic outputs, REHEATEAST provides a concrete pathway for cities and regions seeking to reduce fossil fuel dependence, improve energy efficiency, and build more sustainable and resilient heating systems.

DHC Explorer: Unlocking Insights into District Heating Across Central and Eastern Europe

The REHEATEAST project has developed the DHC Explorer, an innovative online visualisation platform designed by National Energy Agency of Hungary (NEA) to provide a comprehensive overview of the district heating and cooling (DHC) sector across Central and Eastern Europe.

Covering eight countries (Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Romania, Serbia, Slovakia, and Slovenia) the platform brings together an extensive and unique dataset to support better understanding and decision-making in the sector.

Developed through in-depth data collection and analysis carried out by REHEATEAST project partners, the DHC Explorer enables users to explore the challenges of the DHC sector at multiple levels. Speaking about country-wide trends, regional and individual utility-based data, the platform offers detailed insight allowing stakeholders to compare key indicators across geographical and operational contexts.

Beyond data, the platform also highlights best practices identified throughout the REHEATEAST project. These examples provide practical inspiration for improving energy efficiency, modernizing infrastructure, and advancing sustainable heating and cooling solutions across the region.

The DHC Explorer is designed for a wide range of users, including policymakers, energy system planners, utility operators, and researchers. By making complex datasets accessible in an easy-to-interpret way with graphical design, it supports evidence-based decision-making and fosters collaboration among stakeholders. This way it could contribute to the development of resilient and sustainable energy systems.

Discover the platform:
reheateast.neuzrt.hu

District Heating and Cooling – Stakeholder Survey and Analysis of Results

This REHEATEAST report investigated stakeholders' perspectives on district heating and cooling (DHC), focused on identifying key challenges, barriers, and potentials for developing energy-efficient, economically viable and environmentally sustainable DHC systems based on identified gaps, good practices and emerging trends.

A structured, survey-based approach was used to capture the views of a wide range of stakeholders and provide a comprehensive overview of the current status of DHC systems. Five main stakeholder groups were targeted: heat producers and utilities, authorities and regulators, technology suppliers and contractors, financiers and investors, and consumers and media. Each group was approached with a tailored questionnaire designed to reflect its specific role, interests and responsibilities within the DHC sector.

The questionnaires addressed key topics including technical and regulatory barriers, investment needs, integration of renewable energy sources, deployment of new technologies, required improvements, and expectations regarding future developments. Standardised survey formats ensured consistency across countries, while project partners were responsible for stakeholder engagement and data collection at the local level. Each partner country analysed the information collected through the questionnaires. A regional SWOT analysis was then developed to provide a holistic view of the current state and future prospects of district heating systems in the Eastern Danube region.

The conclusions highlight that the future of district heating systems in the REHEATEAST region is promising but requires coordinated action across multiple fronts. Cross-sectoral collaboration is essential to create a supportive policy environment that facilitates the transition to renewable technologies. At the same time, significant investments are needed to modernise infrastructure and deploy advanced technologies such as smart metering and digital monitoring systems.

Find the full document here.

Gap Analysis of Current Practices and Policies

Deliverable D.2.1.4 provides a systematic gap analysis between current district heating and cooling (DHC) practices and targeted goals. It expands on the data collected in the earlier phases of the REHEATEAST project, including the DHC stakeholder survey conducted in Deliverable D.1.1.5, as well as the in-depth analysis of existing challenges, gaps, and best practices within the DHC sector outlined in Deliverable D.1.2.1, and the comparative analysis of the institutional, legal, and financial status quo of DHC in Deliverable D.1.2.2.

The analysis was carried out in two steps. First, country-level assessments examined discrepancies between stated objectives and actual DHC practices, revealing nationally specific technical, regulatory and financial constraints. This was followed by a cross-country analysis identifying persistent regional gaps and inconsistencies. Despite differing national contexts, common challenges emerged. Those include ageing and inefficient infrastructure, continued reliance on fossil fuels, fragmented ownership and regulatory frameworks, insufficient financial incentives, limited data transparency, planning deficiency and low consumer engagement. To enable a systematic comparison among REHEATEAST countries, the findings were synthesised through a regional SWOT and PEST analysis.

At the same time, the deliverable confirms strong stakeholder motivation to address these gaps. Reducing greenhouse gas emissions, improving energy security, modernising ageing infrastructure, demonstrating the value of innovative DHC solutions, strengthening stakeholder cooperation, aligning national policies with EU objectives, facilitating access to funding, and addressing social challenges such as energy poverty are seen as key drivers for change. These motivations underline a strong interest in practical, demonstrative actions.

By combining country-specific assessments, comparative SWOT and PEST analyses and stakeholder insights, this gap analysis provides a strategic basis for prioritising actions and needed interventions that respond to both regional commonalities and national specificities across the REHEATEAST area.

Find the full document here.

Comparative Analysis of the Institutional, Legal, and Financial Status Quo of DHC

A comprehensive comparative analysis of the institutional, legal, financial, and technical status quo of district heating and cooling (DHC) systems, presented in the report, shows, that the DHC sector exhibits a significant diversity across the REHEATEAST project region. While some areas benefit from well-developed, high-density networks, others rely on fragmented systems with limited reach and lower service reliability. These differences reflect uneven development paths and emphasize the need for targeted modernisation strategies.

DHC systems remain heavily dependent on fossil fuels, particularly natural gas. Although the interest in renewable energy sources (RES) and waste heat is growing, their integration is still limited due to outdated infrastructure, weak investment incentives, and insufficient technical expertise. Also, high thermal losses and operational inefficiencies continue to impair system performance, reinforcing the need for modernisation that combines RES integration with improved energy efficiency of buildings.

While some regulatory and policy frameworks are well aligned with EU decarbonisation goals, others face challenges due to fragmented governance and limited institutional capacity. Gaps in planning coordination, weak enforcement of strategic documents, and inconsistent municipal engagement hinder the progress of DHC sector.

Public funding remains the primary driver of DHC investment in the region. However, many areas struggle to develop bankable projects and continue to rely on operational subsidies, particularly for fossil-based systems. Emerging financing models such as public-private partnerships, energy performance and supply contracting, and citizen-led energy communities remain largely untapped.

Furthermore, social factors such as high heating costs, energy poverty, and low level of consumer engagement affect both, the acceptance and the stability of DHC systems. Strengthening transparency, improving service quality, and involving consumers more actively into energy planning are essential for mutual trust and long-term resilience of DHC systems.

The transition to low-temperature, interconnected, smart DHC systems largely depends on local expertise, consistent access to modern technologies, and strong institutional support. In the future, the development of modern, flexible, resilient, and sustainable DHC systems will be based on decarbonisation, digitalisation, and sector coupling combined with innovative financing and governance models.

Find the full document here.

Policy and DHC Optimisation Recommendations: Supporting the Transition to Sustainable Heating Systems

The REHEATEAST project has developed a comprehensive set of *Policy and DHC Optimisation Recommendations*, coordinated by the Center for Energy Efficiency EnEffect, to support the modernisation and decarbonisation of district heating and cooling (DHC) systems across Central and Eastern Europe.

Covering eight countries: Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Romania, Serbia, Slovakia, and Slovenia the deliverable brings together insights from diverse national contexts to identify common challenges and opportunities for the sector.

The recommendations are based on a combination of analytical work, pilot project results, and stakeholder engagement carried out throughout the project. By linking technical findings with policy dialogue, the deliverable provides a practical bridge between evidence and implementation.

A key focus is placed on recommendations addressing important areas such as regulatory frameworks, financing mechanisms, digitalisation, and institutional coordination, offering concrete directions for improving the overall policy environment.

In addition to country-specific proposals, the deliverable contributes to a joint policy perspective at project level, supporting alignment with broader EU energy and climate objectives.

Designed for policymakers, public authorities, and sector stakeholders, the recommendations provide clear guidance for developing more efficient, resilient, and low-carbon heating systems. By translating complex analyses into practical solutions, the deliverable supports informed decision-making and helps accelerate the energy transition in the region.

Online Training Materials for Professionals and Policy-Makers

A successful transition toward sustainable district heating and cooling (DHC) systems requires not only advanced technologies but also well informed professionals and decision-makers. Within the REHEATEAST project, *Deliverable D.3.1.4 - Online Training Materials for Professionals and Policy-Makers* was developed to strengthen knowledge and capacity among stakeholders involved in the planning, operation, and governance of DHC systems in the Danube region.

The training materials provide a structured learning resource covering the district heating and cooling value chain. They introduce the fundamentals and benefits of DHC systems and present key technologies for sustainable heat production, including geothermal energy, solar thermal systems, heat pumps, combined heat and power, and waste heat recovery. The curriculum also covers thermal energy storage, district cooling, and the design and optimisation of heat transport and distribution networks.

Beyond technical foundations, the materials address strategic and policy-related aspects of DHC modernisation, including energy efficiency, green procurement, standardisation, and emerging smart energy solutions. Designed for engineers, utility operators, urban planners, and public authorities, these resources are available through an online platform to support practical learning and regional knowledge exchange.

By enhancing both technical and strategic expertise, this deliverable facilitates the adoption of renewable energy and the development of resilient, low-carbon systems across the Danube region.

Find the full document here.

Renewable Heat Supply Options for District Heating

Tuzla, Bosnia-Herzegovina

This Pilot project aimed to investigate the future renewable district heating thermal energy supply for the University of Tuzla campus, Bosnia Herzegovina. Various technologies were considered, such as Pit Thermal Energy Storage (PTES), a dual-source heat pump that can use both outdoor air and low-temperature PTES water, a solar thermal system and an electric boiler. These technologies and plants were analyzed for the Pilot project regarding their suitability and dimensioned according to the scenario or district heating demand.

The consulting company that was commissioned to prepare the Pilot, in consultation with the Aarhus Centre and the University of Tuzla, has concluded that the initially designated system design with a solar thermal plant, PTES and heat pump is not suitable for the specific case of the University of Tuzla campus. Due to space limitations, restrictions respective to geography and geometry of the available land areas, lack of heat demand during summertime and increased heat storage demand, alternative and more suitable solutions have been investigated.

Consequently, it has been agreed to design a thermal energy supply system consisting of an air source heat pump and a steel tank heat storage for hourly, daily or weekly thermal energy storage, while an electric boiler is integrated for redundancy, security of supply, operational flexibility and cost-efficient future integration of fluctuating renewable electricity. The proposed heat pump system is utilizing the environmentally friendly and real-life proven natural refrigerants propane and isobutane, allowing efficient heat production even during cold winter times when the heat demand is high. In addition, a PV installation with a yearly specific electricity power output of approximately 1249,5 kWh/kWp of renewable electricity has been assumed. As a result, approximately 3.306 MWh of electricity could be generated by the PV installation on the campus of the University of Tuzla. This solution promises enough available land areas, technical feasibility, as well as cost-efficient operation over the entire plant lifetime.

Heat Loss Reduction with Advanced Monitoring and Precise Operational Adjustments

Rijeka-Podmurvice, Croatia

This pilot project focuses on five interconnected buildings in the Podmurvice neighbourhood of Rijeka, which rely on two gas boilers for winter space heating. Despite a renovated DH network, the system experiences extremely high heat losses of 35-40%. The main objective of the pilot was to digitalise the system and improve its operational efficiency.

Key measures implemented include the deployment of software for hydraulic analysis of the network, installation of a remote monitoring system, introduction of remote control functionalities, and upgrading of valves in two substations with throttles.

The system installed within the pilot project enables real-time supervision of operation, providing continuous information on key parameters: temperatures, pressures, flow rates, and others. Consequently, the operators can promptly adjust and optimise the system performance.

Although the equipment operation is covering only a short period, initial measurements already confirm improvements. Compared with 2024 and 2025, data for 2026 show reduced heat losses, with an estimated achievable maximal reduction of up to 25%. The pilot demonstrated benefits at a smaller scale and provides a model that can be replicated and scaled to other parts of the network.

Key activities performed include:

- analysis of the present situation and development of the concept
- procurement procedures and other related technical, fiscal and organisational matters
- coordination with contractors and ASP (Energo) during implementation
- site visits and inspections

DHC System with Solar PV and Heat Pumps

Zagreb, Croatia

The pilot project *“Pre-feasibility evaluation of solar PV potential and development at the HEP Toplinarstvo Zagreb site”* is a pre-feasibility study of an alternative heat supply.

The pilot aimed for an optimal system configuration and heat supply solution using available resources at the observed location, the HEP Toplinarstvo office building. Based on the analysis, the most suitable concept would be a photovoltaic power plant installed on the available roof surface to cover a part of the demand for sanitary hot water during the summer, and, when available, to support space heating in the transition periods (spring and autumn). The existing hot water tank, equipped with electric heaters, could use “green” power from the PV system to reheat and cover peak loads. Thermal storage tanks at the same location can store the heat produced by the boiler.

The existing conventional DH supply would, in any variant, remain as a backup or additional load covering source.

The study provides a detailed analysis of the photovoltaic potential at the location and additionally addresses the relevant regulatory framework and funding opportunities for potential further development.

Key activities performed include :

- analysis of the present situation on-site and assessment of space and resources
- development of the concept
- technical analysis of PV plant potential with different configurations
- analysis of regulatory framework and funding opportunities

Cooperation and Optimisation of District Heating and Cooling Systems

Priboj, Serbia

This REHEATEAST pilot in the Municipality of Priboj focuses on improving district heating performance through a combined approach of building-level energy retrofit planning and strengthened stakeholder cooperation.

The pilot addresses a common challenge in district heating systems: inefficient building stock significantly increases heat demand, while fragmented decision-making and limited user control hinder effective investments. To tackle this, the project applies a holistic approach, combining technical building audits with stakeholder engagement to support better-informed local energy planning.

The pilot is based on detailed energy audits of three representative multi-apartment residential buildings, covering nearly 200 flats. The analysis identifies substantial potential for improvement through a consistent set of measures, including thermal insulation of building envelopes, replacement of inefficient windows and doors, and the introduction of thermostatic valves and heat cost allocators. These interventions not only reduce heat consumption but also improve comfort and transparency for residents.

The results demonstrate significant impact potential. In the most detailed case, energy consumption could be reduced by over 50%, with deeper renovation scenarios achieving more than 70% savings, alongside notable reductions in costs and CO_2 emissions. This confirms that building-level interventions are a key component of district heating optimisation.

Beyond technical findings, the pilot’s main added value lies in its governance model. By combining audits with stakeholder workshops and municipal coordination, it creates a shared knowledge base for future investments and strengthens cooperation between local authorities, utilities, experts, and residents.

The pilot provides a transferable methodology for other municipalities facing similar challenges, supporting the integration of energy efficiency measures into district heating modernisation strategies and contributing to long-term decarbonisation efforts.

Stakeholder Cooperation for Building Energy Retrofits

Budapest, Hungary

The NEA pilot aimed at analysing stakeholder cooperation in apartment building energy retrofits. Beyond secondary market research, primary market research focusing on a geographic area (within District III of Budapest) was carried out. Stakeholder groups engaged included apartment owners, building operators, construction and engineering firms active in implementing building energy retrofits, the local municipality and the district heating service provider.

The area in focus has close to 15,000 apartments in over 100 apartment buildings with a total final heat consumption equivalent to over 10 million m^3 of natural gas per annum. About ¾ of apartment owners surveyed live in their own property and about ¼ plan to live there for more than five years.

Prior building energy systems improvement investment projects typically resulted around 20% heat savings, according to statistics on prior building improvement projects (realised, results measured) received from the Budapest district heating service company in the pilot activities.

The main findings were that various energy, housing and fiscal policy and regulatory measures determine the building energy retrofit market. Illustrative key elements are fossil fuel subsidies, transparency, energy awareness, implementation risks, central bank monetary policies, grants provided for certain societal groups for residential real estate purchases that shape real estate market demand as well as introducing Article 4 of the EU Energy Efficiency Directive - energy efficiency obligations.

District Heating and Cooling System into Heat Energy Communities

how Heat Energy Communities (HECs) can transform district heating by integrating renewable energy sources

The REHEATEAST Pilot 2 developed by Pannon EGTC combines a comprehensive analytical study with a site-specific pilot, forming a coherent framework for advancing renewable-based district heating systems.

The main study explores how Heat Energy Communities (HECs) can transform district heating by integrating renewable energy sources—especially geothermal energy—and thermal storage solutions. It provides a detailed overview of the Hungarian and EU regulatory environment, available technologies, and European best practices, demonstrating that community-based heating systems can reduce fossil fuel dependence while improving energy efficiency and supply security. The analysis also highlights that, despite strong national potential, practical implementation models in Hungary are still limited.

Building on this foundation, the Békéscsaba pilot translates the study's findings into a concrete, real-world application. It proposes a modular geothermal district heating system connecting public buildings, sports facilities, and a thermal spa into a unified network. The pilot demonstrates how local geothermal resources can replace natural gas, reduce CO_2 emissions, and establish a scalable, community-based energy model.

Together, the study and the pilot represent a complete innovation cycle: from strategic analysis to practical implementation. While the study defines the concept, regulatory context, and technological pathways, the Békéscsaba case proves its feasibility at the local level. This integrated approach offers a transferable model for municipalities across Hungary and the Danube Region seeking to modernise district heating systems and accelerate the transition to renewable energy.

Energy Efficiency Optimisation of Building-Level Heat Distribution Systems

Pécs, Hungary

The first pilot implemented by Pannon EGTC within the REHEATEAST project focuses on improving energy efficiency at the end-user level of a renewable-based district heating system, using the University of Pécs as a real-life demonstration site.

The pilot addresses a key challenge in modern energy systems: even when heat production is largely based on renewable sources, inefficiencies within building-level distribution can significantly reduce overall system performance. In Pécs, where district heating is largely supplied by biomass-based combined heat and power, the project identified outdated circulation pumps as a major source of unnecessary electricity consumption and energy loss.

To address this, the pilot applied a targeted modernisation approach, replacing selected high-consumption pumps with modern, high-efficiency, smart-controlled units in key university buildings. The intervention was based on detailed technical assessment, precise equipment sizing, and close cooperation between Pannon EGTC, the University of Pécs, and the local district heating provider. Importantly, the project demonstrated that full system replacement is not required: even limited, well-targeted upgrades can significantly improve performance.

The results clearly exceeded expectations. While the initial target was a 15% reduction in energy consumption, the pilot achieved an average electricity saving of 42.41%, confirming the substantial untapped efficiency potential within existing building infrastructure. These savings translate into reduced operational costs and lower carbon emissions, while also improving the effective utilisation of renewable heat.

The pilot's key added value lies in its simplicity, cost-effectiveness, and strong transferability. It provides a practical, low-investment model that can be replicated in universities, hospitals, and public buildings across the Danube Region. As such, it complements larger-scale system transformation efforts by demonstrating that small-scale, supply-side optimisation measures are essential for maximising the benefits of renewable-based district heating systems.

Mapping of Available Energy Mix for District Heating

Košice Region, Slovakia

The output is a publicly accessible GEOmap (https://www.geoportalksk.sk/mapstore/#/viewer/335) developed within the REHEATEAST pilot action in the Košice Self-Governing Region. It brings together renewable-energy potential, environmental conditions and district-heating-related information in one interactive geoportal-based tool.

The map integrates thematic layers such as solar potential, wind conditions, surface temperature, precipitation, geothermal potential, heat pump suitability, district heating accessibility and district heating sources, together with a building-level layer expressing the energy and environmental potential of individual buildings.

The output was created through the harmonisation of heterogeneous spatial datasets, GIS analysis, methodological validation and technical integration into the regional geoportal environment.

Its main purpose is to support better orientation in heating and renewable energy options, improve the public usability of energy-related spatial data and provide a clearer territorial overview for households, municipalities, investors and public institutions.

The output was complemented by explanatory descriptions of the layers, as well as dissemination-oriented materials as short educational video.

Heat Loss Diagnostics in a Small, Biomass-Based District Heating System

Cankova, Slovenia

The Slovenian pilot in Municipality Cankova, implemented within the REHEATEAST project, focused on optimizing a biomass-based district heating system. Its main objective was to improve energy efficiency, reduce heat losses, and promote the use of renewable energy sources as part of the transition away from fossil fuels.

The pilot combined technical analysis with strong stakeholder engagement. Key activities included infrared (IR) thermographic inspections to identify heat losses in the system and distribution network, detailed performance analysis, and the development of optimisation scenarios. In addition, measures such as improved maintenance of heat exchangers, distribution network and system balancing were tested. Close cooperation between the municipality, concessionaire, and other stakeholders played an important role, particularly in shaping future investment decisions.

The results showed significant heat losses in the system, estimated between approximately 15% and 30%, highlighting substantial potential for improvement. Two optimisation scenarios were developed, both demonstrating tangible energy savings and feasible payback periods. Additional gains were identified through targeted maintenance measures. In the later phase of the pilot, activities focused on concretizing investment options and selecting the most suitable scenario, with local stakeholders expressing interest in further system expansion.

A key lesson learned is that, beyond technical feasibility, successful implementation depends heavily on political commitment, financial capacity, and alignment among local stakeholders. The pilot confirmed strong potential for replication and scaling, while also demonstrating that effective communication and local support are essential for turning technical solutions into real investments.

Improving Energy Efficiency in Multi-Family Buildings

Plovdiv, Bulgaria

The Bulgarian pilot addresses key challenges in district heating (DH) systems by focusing on the demand side and improving energy efficiency in multi-family buildings. Despite DH being widely used in cities such as Plovdiv, many buildings still rely on outdated vertical heating installations, leading to high heat losses, limited control, and increased costs for the households.

The pilot combines three complementary actions. First, it develops scenarios to assess the impact of replacing vertical pipe systems with horizontal layouts, combined with building envelope improvements such as insulation and energy-efficient windows. Second, digital data loggers are installed in 20 domestic hot water (DHW) substations with high losses, enabling detailed monitoring and targeted optimisation measures.

Third, a publicly accessible digital map of selected district in Plovdiv provides guidance to building owners on system upgrades, expected benefits using integrated calculator tool, and real-life examples.

Implemented in cooperation with EVN Toplofikatsia Plovdiv, the pilot integrates technical analysis, digital tools, and stakeholder engagement. It supports informed decision-making, reduces energy losses and costs, and contributes to the modernisation and decarbonisation of DH systems. The results provide a replicable model for improving building-level performance and strengthening the role of consumers in the energy transition.

Digitalised Demand-Side Optimisation at the Building Level in Support of District Heating System

Cluj-Napoca, Romania

The pilot implemented by the Technical University of Cluj-Napoca addresses the digitalisation of the demand side in district heating systems. The pilot is deployed in a laboratory environment within a university building and aims to analyse and optimise thermal energy consumption at the building level through the use of advanced monitoring and control solutions.

The experimental setup integrates existing radiators into a newly developed system comprising a Heat Interface Unit (HIU). Variable-speed circulation pump, 3-way control valve, and motorised control valves, fan coil units, and a comprehensive set of sensors. These sensors monitor key parameters, including temperature, pressure, flow rate, indoor and outdoor environmental conditions, and occupancy indicators.

A dedicated data acquisition and control system has been implemented to enable real-time monitoring of system performance and to support the deployment of demand-driven control strategies. The pilot includes several experimental scenarios, such as operation with and without control, operation under low supply temperature conditions, and the evaluation of domestic hot water production.

The experimental results obtained under transitional climatic conditions (March) demonstrate that the application of demand-driven control significantly reduces system operating time and energy consumption. Daily energy savings were observed in the range of approximately 40% to 60%, depending on operating conditions. Based on these results, the estimated annual energy savings range between 6% and 24%, corresponding to 0.58–2.30 MWh/year and up to 465 kgCO_2/year of avoided emissions.

Furthermore, the system demonstrated stable and efficient operation under low-temperature supply conditions (30–37°C), highlighting its potential to support the integration of renewable energy sources and the transition towards low-carbon district heating systems.

Overall, the pilot confirms the potential of demand-side digitalisation to improve the efficiency, flexibility, and sustainability of district heating systems. The developed solution is considered cost-effective, scalable, and replicable, providing a solid basis for further deployment in real-life applications.

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- Energy Institute Hrvoje Požar (EIHP), Croatia
- Technical University of Cluj-Napoca (UTCN), Romania
- Local Energy Agency Pomurje (LEAP), Slovenia
- EGTC Via Carpatia, Slovakia
- Standing Conference of Towns and Municipalities (SCTM), Serbia
- Jožef Stefan Institute (JSI), Slovenia
- Resource Aarhus Center (REC), Bosnia and Herzegovina
- Center for Energy Efficiency Eneffect (ENEFFECT), Bulgaria
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