HOW CAN CITIES DECARBONISE HEATING & COOLING

USEFUL RESOURCES

LOCAL HEATING AND COOLING PLANNING AND DECARBONISATION

Covenant of Mayors
for Climate & Energy
EUROPE

COALITION OF THE WILLING ON HEATING AND COOLING

This structured summary is designed to serve as a resource hub on local heating and cooling planning and decarbonisation for Covenant of Mayors signatories. It catalogues key initiatives, projects, guidelines, case studies, tools, and other resources, mainly developed in the framework of EU funded projects, related to and/or useful for local heating and cooling planning and decarbonisation. The structured summary is divided into four sections: Commitment and Mobilisation (1), Mapping (2), Scenario Analysis and Planning (3), and Implementation, Monitoring and Evaluation (4). They thereby cover the various steps needed both to prepare and develop a local heating and cooling plan with useful resources to implement various decarbonisation measures that may be defined in the plan. The structured summary is thus deliberately designed as a toolbox signatories can use throughout the different stages of local heating and cooling planning processes. Some of these resources may be useful for more than one of the four stages of the planning and implementation process, and directions to other sections have in these cases been provided.

Introducing local heating and cooling planning

New and upcoming EU legislations come with new responsibilities related to the planning, coordination, management and execution of energy and climate actions at the local level. This is clearly pronounced in Article 25(6) of the EU Energy Efficiency Directive (EED) - recast, which sets an obligation for regional and local authorities at least in municipalities above 45.000 inhabitants to develop local heating and cooling plans.

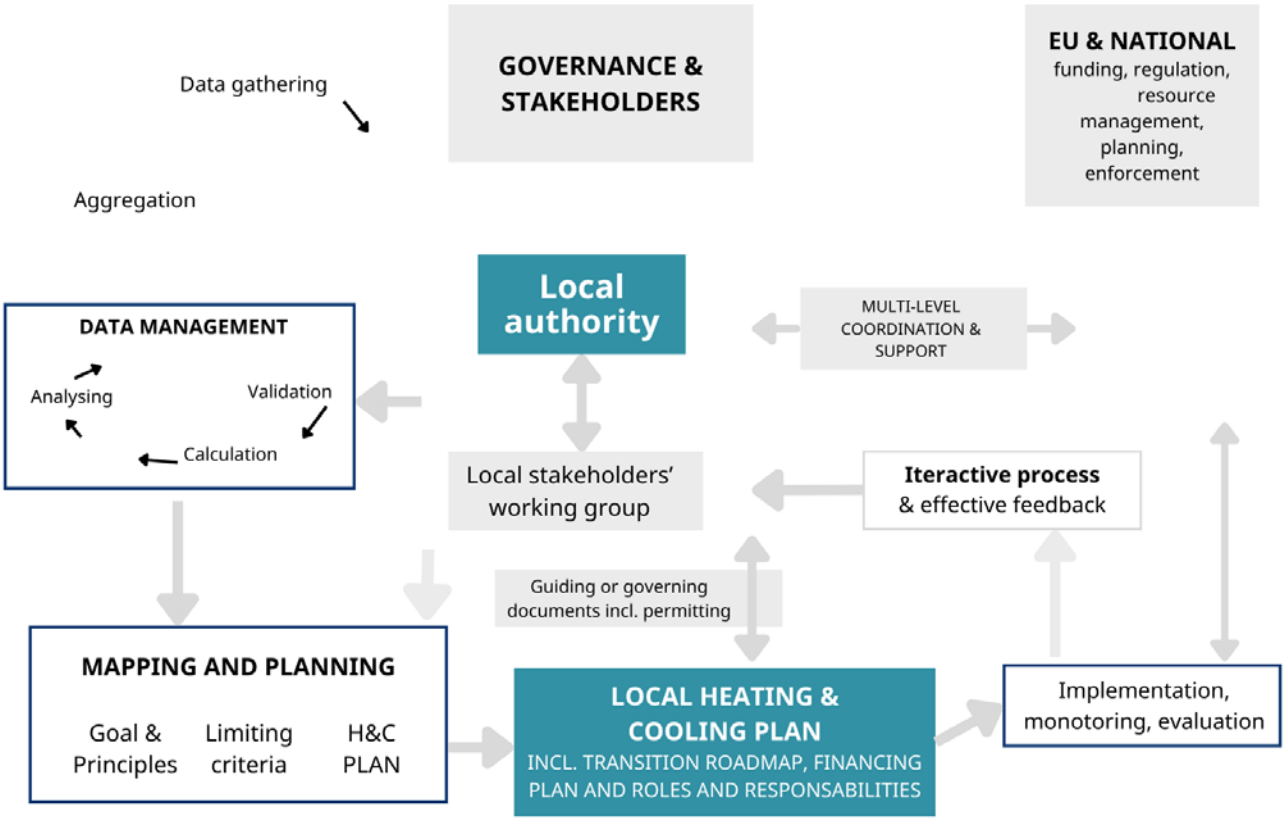
Local heating and cooling planning holds the potential to be an impactful lever for the decarbonization of Covenant of Mayors' Signatories. They provide comprehensive information on the supply and demand of heating and cooling in a territory and can identify spatially appropriate options for renewable energy sources and infrastructures and building refurbishments. Importantly, they also define impactful, reliable, and cost-efficient pathways towards a decarbonised and more climate-resilient built environment, with a course for action. When integrated and aligned with spatial and infrastructure planning (including planning for the phase-out and decommissioning of gas grids), they can become impactful tools for an accelerated transition, that deals with its challenges and complexities in a responsible and well-informed manner, consolidated in communities and democratic decision-making processes.

When developing a local heating and cooling plan, the initial step is to foster commitment and mobilisation by citizens and other stakeholders, and to raise awareness about the need and available options to decarbonise heating and cooling. Fostering broad knowledge on these topics in communities boosts the overall 'energy literacy' which facilitate finding suitable solutions to decarbonise heating and cooling in communities. This is also key for setting common policy objectives and ensuring a democratically anchored transition trajectory. The second step concerns detailed mapping, which provides detailed information about current energy systems and the building stock, and the opportunities for energy savings, efficiency gains, and the use of local and sustainable heating sources. The third step is to develop the heating and cooling plan, which contains a transition roadmap with measures and responsibilities. The final step includes implementation, monitoring and evaluation, which is further enhanced by continuous collaborative dialogues across levels of government in an iterative manner. Finally, it is also important to properly assess existing and available governance and planning tools within the given spatial and regulatory context. This can greatly enhance the effect and efficiency of planning procedures, foster synergies with other spatial planning practices, and prepare the ground for an integrated planning framework for energy, climate mitigation and adaptation.

This structured summary aims to provide useful resources which can support Signatories in their local heating and cooling planning and implementation process, and further strengthen their abilities to govern the clean energy transition in line with the objectives of the European Green Deal.

The figure below illustrates a simplified conceptual design of a local heating and cooling planning process.

CONCEPTUAL DESIGN OF A GENERIC LOCAL HEATING AND COOLING PLANNING PROCESS



Source:

Defard, C. (2023). Energy Union 2.0. to deliver the European Green Deal. Jaques Delors Instiute.

Deliverables from DecarbCityPipes 2050 Project

Oxenaar, S,. et al. (2023). Warming up to it: Principles for clean, efficient and smart district heating. Regulatory Assistance Project.

Wuppertal Insitute; ICLEI; (2023). Toolkit District Heating – A technology overview and pathways towards decarbonisation. European Commission.

Policy context: A New EU-wide obligation for local heating and cooling planning

The EU Energy Efficiency Directive (EED) - recast article 25(6) contains a new EU-wide obligation for regional and local authorities, at least in municipalities above 45.000 inhabitants, to develop local heating and cooling plans. This obligation will be translated into national policy frameworks throughout the coming years. In the directive, Member States are asked to "support regional and local authorities to the utmost extent possible by any means, including financial support and technical support schemes". Strengthened support frameworks and mechanisms for local authorities to carry out these plans may therefore be expected. Member States shall also ensure that heating and cooling plans are aligned with other local climate, energy, and environment planning requirements, both to avoid administrative burden in local and regional authorities and to encourage effective implementation.

The preparation of these plans shall involve all relevant regional or local stakeholders, including operators of energy infrastructures, and citizen-led initiatives such as energy communities. The directive also allows plans to be carried out jointly by a group of several neighbouring local authorities when appropriate. This option may be especially important to consider for smaller Signatories and in countries where municipalities may lack planning and administrative capacities, i.e., often in countries where a low level of decentralisation for mandates and funding persists and without a tradition of local heat/and or energy planning.

As defined in article 25(6) a local heating and cooling plan should contain:

- An estimate, mapping, and strategy for increased energy efficiency (via low -temperature district heating readiness, high efficiency cogeneration, waste heat recovery, renewable energy in heating and energy for cooling in the particular area)
- An analysis of the heating and cooling appliances and systems in buildings
- An analysis of potentials for energy efficiency measures – targeting worst performing buildings and vulnerable households
- A plan to finance the implementation of policies and measures
- A trajectory to achieve the goals of the plan s in line with climate neutrality and a framework for monitoring progress of the implementation of policies and measures.

The 2023 EU EED also implies new requirements for efficient heating and cooling systems, which local heating and cooling planning can greatly facilitate fulfilling. To be classified as efficient according to EED article 26, district heating and cooling systems must progressively integrate renewable energy and waste heat to reach a 100 % share by 2050. Furthermore, the 2023 EU EED provides a legal basis for the application of the Energy Efficiency First Principle (EE1st) (article 3), which shall be monitored by competent authorities in their energy policy and planning. Recommendations for its implementation, including at the local level and in the buildings and heating sector, was provided by the Commission in 2021.

Useful Toolboxes

The two toolboxes below collect many resources useful for local heating and cooling planning and decarbonisation. These toolboxes, which can be consulted throughout the entire planning process, provide guidance and show case studies of heat planning and decarbonisation measures from across Europe.

The Celsius Toolbox - Smart Cities Marketplace

The Celsius toolkit, included in the Smart Cities Marketplace, is a knowledge source for municipalities that strive to develop and transform their district heating systems. The toolbox includes a large number of case studies and guidance documents on business and finance, policy and planning, stakeholder engagement, as well as technical solutions. It also comes with a toolbox glossary. Resources provided in the Celsius Toolkit can therefore be useful across all stages of the local heating and cooling planning and implementation process.

KeepWarm Learning Centre

This resource library about modernising district heating systems has been developed within the framework of the KeepWarm Project. Sorted according to thematic areas, it includes technical solutions and case data inputs, thermal planning tools, business models and funding, sustainable energy sources, financing implementation, and policy recommendations. The resources are mainly targeted towards modernising district heating systems in Central and Eastern Europe but can also prove useful for other spatial contexts.

COMMITMENT AND MOBILISATION

This part contains useful resources with methods to raise awareness about the heating and cooling transition, and to commit and mobilise local stakeholders in a way that enhances the quality and legitimacy of the planning process.

Raising awareness and fostering commitment and mobilisation are crucial aspects in the initial stage of the local heating and cooling planning process. Such actions help the co-creation and diffusion of knowledge among citizens, local stakeholders, and local administration officials on energy savings, energy efficiency, the deployment of fossil-free technologies, and other important factors that drive heating and cooling transitions. Establishing local citizen and stakeholder working groups can be important to foster the dissemination and co-creation of knowledge, awareness, and possible solutions, and to sustain engagement throughout the preparation, planning and implementation process of local heating and cooling plans. These knowledge-exchange and engagement forums are important as they help addressing common challenges and solutions in communities, which can foster well-informed decision-making with targeted, anchored, and impactful measures. Ensuring a fruitful exchange with local stakeholders can also help defining roles, responsibilities and accountabilities throughout the planning and implementation process. This can be key to ensure community-wide legitimacy and trust for the clean energy transition, while strengthening the capacity by local and regional authorities to govern it effectively and responsibly.

Resources to raise awareness and engage citizens, and local and regional stakeholders

A Policy Brief on Decarbonising Heating and Cooling

Published in 2023 by INTERREG Europe.

This Policy brief gives a short introduction to and overview of renewable heating and cooling technologies deployable across the EU, including heat pumps, solar thermal, District Heating and Cooling, and passive houses. The brief also provides a short description of the European policy context and the role of regions and local authorities, with some best practice examples from INTERREG projects.

Co-creation and stakeholder engagement for sustainable heating

Published in 2022 by the SHIFFT Project.

Bringing citizens and local stakeholders on-board and building social legitimacy of decision-making is a fundamental lever for a fair and effective heating and cooling transition. Developed within the EU funded project SHIFFT, this tool provides guidance to local authorities on how to engage and foster collaboration with a multitude of stakeholders locally and to develop co-created solutions to decarbonise heat. The guidance includes a methodology, good practices and two case studies.

Technology choices, data, and mapping for sustainable heating

Published in 2022 by the SHIFFT Project.

This guidance module is concerned with the technical basis of how local governments, citizens and stakeholders can develop heat transition plans. It showcases examples of how maps can facilitate the uptake and roll-out of renewable and efficient heating solutions.

Recommendations for Cities' H/C Supply & Demand in 2050

Published in 2023 by the Decarb City Pipes 2050 Project.

Establishing common long-term decarbonisation visions and goals is an important fundament for strategic local heating and cooling planning. This report developed within the framework of the Decarb City Pipes 2050 project, provides a set of recommendations and a methodology local authorities can apply when establishing a long-term heating and cooling decarbonisation vision for their territory. It gives guidance on the use of data, the use of energy sources, and urban typologies.

Sustainable, Affordable Cooling Can Save Tens of Thousands of Lives Each Year

Published in 2023 by the International Energy Agency (IEA).

This report provides an overview of available technologies, technical measures, and policies for energy efficient space cooling.data, the use of energy sources, and urban typologies.

Resources to raise awareness on technologies and solutions

District heating and cooling

Toolkit District Heating – A technology overview and pathways towards decarbonisation

Published in 2023 by the European Commission.

This toolkit, developed within the European Commission's Initiative for coal regions in transition, provides a comprehensive overview of district heating decarbonisation in EU coal+ regions and outlines the role of regional and local strategic heating and cooling planning. It presents a five-step model for district heating decarbonisation, emphasising measures to reduce demand (sufficiency and efficiency), and installing substitutes for supply, focusing on non-scarce and local renewable heat sources.

Guidelines on Community Heating and Cooling

Published in 2023 by REScoopEU.

This guideline document introduces renewable citizen-led district heating and cooling solutions, including applicable technologies, proposed financing models, and advice on how to replicate successful examples.

Integrating Low-temperature Renewables in District Energy Systems

Published in 2021 by International Renewable Energy Agency (IRENA) Aalborg University.

This guidebook provides guidelines for policy makers and examples of available tools and solutions to facilitate the use of low-temperature renewable heat sources in new and existing district energy systems. It includes an overview of enabling regulatory conditions, financing and business models, and the central role of local/strategic heat planning to modernise and expand DH systems and networks.

Developing District Heating in North-West Europe - A Guide for Public Sector Organisations

Published in 2019 by the HeatNet NWE Project - Interreg North-West Europe.

This document gives a brief overview of 4th generation district heating and cooling (4DHC) and its benefits, guidance to public sector organisations to develop these systems. A more extensive non-technical introduction to 4DHC and its benefits, from the same project is accessible here.

Solar Heat for Cities, the sustainable solution for district heating

Published in 2019 by IEA Task 55, European Copper Institute.

This leaflet provides a short introduction to how solar heat can be used for district heating, coupled with examples from across the world.

Solution booklet District Heating

Published in 2021 by IEU Smart Cities Information System.

This booklet with good practice examples provides a concise but broad introduction to the development of district heating and cooling. It covers the urban context in which these systems are deployed, societal and user aspects, technical specifications, examples of business models and finance, governance and regulation including key steps for developing these systems, and general lessons learned.

Sustainable District Cooling Guidelines

Published in 2019 by IEA's Technology Collaboration Programme on District Heating and Cooling.

This extensive guidance document introduces district cooling and its benefits, followed by more detailed descriptions of its development, use, and operation, including case studies. The document can also be useful to consider in section 4 of this structured summary.

Linking heating and cooling with intertwined issues

EU-level technical guidance on adapting buildings to climate change - Best Practice Guidance

Published in 2023 by the European Commission.

This document aims to provide technical guidance with best practices on climate-adaptation measures at the building scale. These adaptation measures, including measures to reduce energy demand for space cooling and to improve the energy performance standards, aim to be relevant for both new and existing buildings across the different climatic zones of Europe.

7 practical steps to energy poverty diagnosis

Published in 2023 by the Energy Poverty Advisory Hub (EPAH) – European Commission.

This short learning guide, translated to all official EU languages, provides seven practical steps local authorities can take to develop an energy poverty diagnosis. Such diagnosis can help a local authority identifying the root causes for energy poverty in their municipality, which can facilitate designing effective mitigation measures integrated as a dimension in the local energy and spatial planning. The learning guide is based on a more extensive Guide to Energy Poverty Diagnosis developed by the EPAH.

The Cities Energy Saving Sprint – Toolkit on emergency energy saving measures

Published in 2022 by the European Commission: Covenant of Mayors for Climate & Energy Europe.

This short synthesis highlights various energy saving measures local authorities can take as part of the Energy Savings Sprint initiative launched in 2022 by the Covenant of Mayors Europe. The initiative also includes a repository of short-term energy saving actions taken by local authorities across Europe. Some of these measures can also build a foundation for long-term and sustained action towards decarbonisation and energy sufficiency.

Beating the Heat: A Sustainable Cooling Handbook for Cities

Published in 2021 by the United Nations Environmental Programme (UNEP) Cool Coalition

This manual presents a comprehensive overview of sustainable urban cooling approaches, incorporating intervention strategies and case studies at the city or district level applicable across diverse regional and national contexts.

MAPPING

The second part of the document concerns guidelines, documents, and tools useful for developing heating and cooling maps. Mapping constitutes a cornerstone of local heating and cooling plans, from which strategic, detailed and spatially adjusted local decarbonization pathways can be built. Mapping and modelling provide knowledge about the existing energy system and infrastructure, the spatiotemporal heat and cooling demand, including the energy performance and usage in buildings, and the availability of local and sustainable energy, waste heat and cooling sources. From this, more detailed assessments on clean energy system integration can be made. This can help ensuring local clean heat supply can meet demand in a strategic, spatially optimised, just and cost-efficient manner that also enhances the flexibility and robustness of a heating system.

Mapping and modelling process is greatly facilitated by good access to detailed and regularly updated energy-related and other spatial data. These data can be provided through databases and analysed through geographic information systems (GIS) and standardised energy modelling tools and procedures. The resources outlined below include both guidance documents which shows the purpose and use of detailed and comprehensive heating and cooling mapping, and already available mapping tools.

General Resources

Guidance for cities developing H/C plans

Published in 2022 by Decarb City Pipes 2050 Project.

This guide outlines possible procedures for creating a Heating and Cooling Map (H/C Map), including the necessary base maps to gain knowledge about the existing heat infrastructure, heat demand, and available local renewable energy sources (RES).

HeatNet NWE Guide to heat mapping

Published in 2022 by HeatNet NWE Project - Interreg North-West Europe.

This guide explains the different steps needed to map heat demand and renewable heat potential within a territory, specifically useful for the development of 4th generation DHC projects. The guide also shows examples of available resources, tools and types of data that support heat mapping exercises.

Mapping tools and databases

Hotmaps tool

Published in 2019 by the Hotmaps Project.

The Hotmaps project has developed an open-source spatiotemporal modelling and heating and /cooling mapping and planning toolbox. It provides a relevant default data set for EU27 at national and local level. This data can be adapted, and users can add their own local data more accurate, larger, and more complex for specific areas can be added. The Hotmaps tool has a capacity for spatiotemporal mapping, analysis, and modelling of the energy supply and demand structure of a territory, allowing comparison of different decarbonisation scenarios, and thus a key tool for heating and cooling planning. It is thus a relevant tool to use also for the stage 3 Scenario analysis and Planning, underlined below.

The Pan-European Thermal Atlas (PETA) 5.2

Published in 2022 by Heat Roadmap Europe Project; Europa-Universität Flensburg, Halmstad University and Aalborg University.

This tool, developed within the Heat Roadmap Europe Project, allows users to identify energy efficiency gains, as well as waste heat energy and geothermal heat sources across different geographies. It maps the current heat demand distribution across different sectors and end-users and provides tools to analyse cross-sectoral and systemic energy efficiency gains. PETA datasets are accessible through the OpenDataHub spatial data platform.

Global Atlas for Renewable Energy

Published in 2021 by International Renewable Energy Agency (IRENA).

The Global Atlas for Renewable energy is an online platform which provides data useful for mapping the availability of and potential for renewable energy sources and infrastructures in selected territories.

SCENARIO ANALYSIS AND PLANNING

This third part contains useful resources on the process of drafting of heating and cooling plans, including scenario development, and on how local heating and cooling plans can be effectively integrated as a key instrument in the broader strategic cross-sectoral energy and spatial planning frameworks of municipalities and regions. A heat strategy based on scenario analysis is a key and integral part of a local heating and cooling plan. More detailed action and implementation plans that refines measures, roles and responsibilities can be drawn from the strategy, including a trajectory to achieve the goals of the plans in line with climate neutrality objectives, a financing plan, and a framework for monitoring and evaluating implementation.

A proper integration and alignment of local heating and cooling plans in the broader local, regional, and national energy and spatial planning frameworks is important to ensure effective implementation and to achieve tangible emission reductions and other strategic objectives, including energy system integration. Planning tools for local authorities may, for instance, include land-use and spatial planning, permitting1 procedures, and building regulations. The ability to implement measures defined in municipal planning documents may also be enhanced by the possession of public housing estates and energy infrastructures. Nevertheless, the availability of tools and capacity to use them differ greatly across member states, reflected in a large variety of local governance capacities and competences across Europe, as well as large differences in legislation and support frameworks for local heating and cooling planning

Planning tools and methods

Non-financial policy tools for sustainable heating: City strategies, regulation and support

Published in 2022 by the SHIFFT Project.

This guidance documents provides a 'structured approach' for developing a municipal heat strategy, with key aspects to consider for the management of this process. It includes recommendations for non-financial instruments that strengthen municipal capacities for the heat transition, including planning and building regulation, skills support, and one-stop shops, and proposes solutions to overcome capacity and governance constrains. This guidance document can also be useful to consider already in the commitment and mobilisation phase, as it provides examples on the establishment of a local 'heat coalition', i.e., working group, which can be reinforced as a useful mechanism for feedback and knowledge co-creation throughout the planning process.

Stock Take on Available Good Planning Practices

Published in 2023 by the In-Plan Project.

Properly integrating local heating and cooling plans in existing planning and governance framework is key to ensure their effectiveness and for reducing administrative burden. Developed as part of the IN-PLAN project, this document focuses on good governance practices local and regional authorities can use based on tools and resources already available, for instance by integrating energy planning with land use planning. It also includes recommendations and 6-key steps for achieving a successful integrated planning outcome. This document is also relevant for the section Commitment and mobilisation.

THERMOS tool

Published in 2019 by Thermos.

THERMOS is a free, open-source software for district heating and cooling planning. It offers local authorities street-level data for which spatially optimised heating and cooling solutions can be assessed. The tool helps its users identifying: optimal paths and connections for the expansion of an existing DHC network; local heat demand and network paths to match a known energy source; an optimal network solution to match available energy sources and demand. It also allows for performance assessment of potential DHC networks and a non-DHC solutions and could hence be a powerful tool for heating and cooling planning.

Online cost estimation tool

Published in 2016 by FROnT project.

This tool allows the user to assess the competitiveness of renewable energy technologies (biomass, solar thermal, air-source heat pump and ground-source heat pump) against fossil fuel dependent systems for individual buildings.

Case Studies

H/C Plans of Cities with Cross-city synthesis

Published in 2023 by the Decarb City Pipes 2050 Project.

This synthesis presents the heating and cooling plans in detail of the cities participating in the Decarb City Pipes 2050 Project, with a summary and comparison of all plans. The summary highlight differences and similarities between the cities' current conditions, e.g., climate, heating systems and the state of the built environment, and challenges encountered throughout the process of drafting the plans. Hence, it provides insight valuable insight to local authorities developing heating and cooling plans.

Best practices for planning and construction of thermal networks identified in the EU

Published in 2021 by TNO and DBDH for the Joint Research Centre, European Commission.

This study provides an analysis of experiences and best practices in both the urban planning and construction phases for thermal networks of use cases in eight different EU countries. Each case includes an overview of the historical and current background (of the heating system), the regulatory framework, the case study of the planning process, and identified best practices.

Financing and business models

Financial Policy – instruments for sustainable heating

Published in 2022 by the SHIFFT Project.

Developed within the SHIFFT Project, this module outlines financial policy instruments, describes good practice for their application and addresses a range of common challenges. Examples from cities taking part in the SHIFFT project and others are provided.

Innovative Finance Mechanisms for Geothermal Energy

Published in 2021 by the CrowdThermal Project.

This report describes innovative finance schemes that have been or can be used in future to increase the involvement and commitment of community members to and in geothermal projects. The finance schemes are all alternative, aiming to involve communities in future geothermal projects.

How to set up a One-stop-shop for integrated home energy renovation? A step-by-step guide for local authorities and other actors

Published in 2020 by the Innovate Project.

This step-by-step guide aims to help local authorities and other actors to create one-stop-shops (OSS) for integrated home energy renovation. The guide introduces the concept of OSS and provides examples of different types of OSS business models, recommendations for newcomers, and a number of good practice case studies from municipalities and regions across the EU and UK.

Guide to governance and business models

Published in 2020 by the HeatNet NWE Project - Interreg North-West Europe.

This guide looks at the key elements found in different District Heating and Cooling (DHC) business models. It provides a general overview of all the key aspects to consider when developing a sustainable DHC business model, including roles and responsibilities among the array of involved stakeholders, including local authorities, property owners, and consumers. It also addresses risks associated with 4th generation DHC deployment and how they can be managed and gives examples from existing cases.

Guideline on business models and financing schemes for retrofitting DH networks

Published in 2019 by the Upgrade DH Project.

Targeting existing District Heating (DH) networks, this guideline covers different business and ownership models, sustainable financing solutions, and costs and revenues of projects aimed at retrofitting existing DH networks.

Guide to financing 4DHC

Published in 2019 by the HeatNet NWE Project - Interreg North-West Europe.

The guide is targeted at project managers tasked with developing and implementing district heating and cooling projects, which tend to be large and complex. It aims to impart an understanding of what investors need in relation to the financing of energy projects and provides an overview of the different sources and structuring of investment finance.

4th generation DHC - Procurement Guide

Published in 2019 by the HeatNet NWE Project - Interreg North-West Europe.

This document, developed as part of the HeatNet NWE Project, provides guidance to local authorities to procure complex DHC, with case studies from six pilot partners.

Technology deployment

Guidebook for the Digitalisation of District Heating: Transforming Heat Networks for a Sustainable Future

Published in 2023 by the International Energy Agency Collaboration Programme on District Heating and Cooling (IEA DHC).

This guidebook shows how digitalisation can play an important role for enhanced efficiently and flexibly of increasingly complex and decentralised district heating (DH) systems; both for maintaining consistency of supply and for effective participation in the power system balancing market. It showcases key areas and aspects for digitalising DH systems, including its technical, financial, and legal aspects.

Low-Temperature District Heating Implementation Guidebook

Published in 2021 by the International Energy Agency Collaboration Programme on District Heating and Cooling (IEA DHC).

This extensive guidebook provides tangible information that can facilitate the implementation of low-temperature district heating (LTDH) systems. This guidebook aims to provide simple advice and recipes for obtaining lower network temperatures and other new features in existing and new district heating systems. This ambition is accomplished by summarising gained experiences from early adopters in various urban areas throughout Europe.

Upgrading the performance of district heating networks: Technical and non-technical approaches

Published in 2019 by the Upgrade DH Project.

This handbook about upgrading district heating presents the process, some key elements (business models, funding, permitting, contractual issues, etc.) and technological solutions.

Guide to home and building energy management

Published in 2019 by HeatNet NWE Project - Interreg North-West Europe.

This guide is a tool for efficient energy management of 4DHC, both targeting network managers, building managers, and building users, thus focusing on organisational rather than technical solutions.

District Heating and Cooling Connection Handbook

Published in 2015 by International Energy Agency Collaboration Programme on District Heating and Cooling (IEA DHC).

This report is intended to assist engineers and consultants in designing and cost-effectively implementing conversions of building heating, ventilation, and air conditioning (HVAC) systems to carry hot and cold water from district energy systems. The report, divided into a cooling section and a heating section, looks at the fundamentals and principles of the supply, distribution and customer interface of district heating and cooling. As it also outlines various benefits that district energy can bring to the building owners, the municipality, and the public, it may also be useful to consider for section 1.

Heat Pumps in District Heating and Cooling Systems

Published in 2019 by International Energy Agency Collaboration Programme on Heat Pumping Technologies (IEA HPT).

A comprehensive report on heat pump use in district heating and cooling.

Biogas: renewable energy for your region!

Published in 2019 by BiogasAction project.

This publication draws up an overview of the activities developed during the BiogasAction project and showcases examples on scaled up biogas production at the local and regional level. Nevertheless, consideration for the scarcity of a sustainable supply of biogas (and biomass) and its end-use should be taken when implementing measures to decarbonise heating systems (European Commission, 2023).

Guidelines for institutions for nutrient management at biogas plants

Published in 2022 by Central Baltic Interreg Programme: Sustainable Biogas.

This guideline document aims to help authorities to plan and implement biogas production in a more sustainable way from the point of view of nutrient management. The guidelines aim to minimize nutrient emissions in biogas production process, and improve the management and treatment of nutrients and other types of waste.

Solar District Heating Knowledge Centre

Published in 2018 by the Solar District Heating Project

This knowledge centre provides many examples of solar district plants, and guidelines to develop solar heating plants to supply district heating systems, in cities and villages with and without district heating.

Design Guidelines for Seasonal Thermal Energy Storage Systems For All Europe

Published in 2015 by the EINSTEIN Project.

Seasonal thermal energy storage systems (STES) are critical for building a robust renewable heat system, as they ensure a capability to account for seasonal fluctuations and bridge periods of low heat production. This report provides information and general guidelines useful for a preliminary assessment of a new STES, including relevant technical issues needed to be considered for a STES system integration between the heat distribution system and the built environment.

Handbook for increased recovery of urban excess heat

Published in 2022 by ReUseHeat Project.

This handbook provides an introduction to Urban Waste Heat utilisation (hence also useful in Section 1), showcases potential urban waste heat sources and their integration to District Heating systems, and more detailed examples of best practices from demonstration sites. It also highlights barriers and how to overcome them, how to build business models and foster collaboration between stakeholders, and how to commission projects.

Decision making tool online for deep-geothermal projects

Published in 2022 by DGE-Rollout Project - Interreg North-West Europe.

This decision-making tool helps investors and decision-makers to gain initial information useful for deep geothermal energy projects. Based on three main axes: Economics, Geology/Technical, and Regulatory framework/Public acceptance, it helps to overcome uncertainties and build confidence for investment in new projects.

Waste heat and cold recovery case studies

Published in 2019-2923 by the EMB3Rs project.

These case-studies from across Europe, developed within the EMB3Rs project, highlight examples of the integration of waste-heat from industries into district heating networks. Examples include a cement producer, a metal casting company, an industrial park, and local supermarkets.

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