Deliverable 3.3. – Heat networks (& Citizen-led renovation) TANDEMS model in 3 countries

07.04.2025

Final version

lifetandems.eu

@LifeTandems

Life TANDEMS

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

## DOCUMENT DESCRIPTION

| | |
|---|---|
| **Related Work Package** | WP3 |
| **Deliverable Lead** | ZuidtrAnt |
| **Author(s)** | Sophie Loots \| contributions from Steven Laurijssen, Sylvia Breukers, Erika Meynaerts |
| **Contact** | sophie@zuidtrant.be |
| **Grant Agreement Number/ Funding Body** | 101077514 |
| **Start Date / Project Duration** | 1 October 2022 / 36 Months |
| **Type of Deliverable (R, DEM, DEC, Other)**[1] | R |
| **Dissemination Level (PU, SE)**[2] | PU |
| **Date of Last Update** | 07/04/2025 |
| **Project Website** | [https://lifetandems.eu/](https://lifetandems.eu/) |

## REVISION HISTORY

| Revision No. | Date | Description | Author(s) |
|---|---|---|---|
| 0.1 | 01.02.2025 | 1st draft | Sophie Loots |
| 0.2 | 23.02.2025 | 2nd draft | Sophie Loots |
| 0.3 | 31.03.2025 | 1st Review | Maria Saridaki |
| 0.4 | 03.04.2025 | 3rd draft | Sophie Loots |
| 0.5 | 07.04.2025 | Final Review | Maria Saridaki |

*This document reflects only the authors' views. The Executive Agency European Union is not responsible for any use that may be made of the information it contains.*

[1] **R** = Document, Report; **Dem** = Demonstrator, pilot, prototype; **DEC** = website, patent filings, videos, etc; **OTHER** = other
[2] **PU** = Public, **SE** = Sensitive

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

## LIST OF FIGURES



## LIST OF ABBREVIATIONS

| | |
|---|---|
| **VVSG** | Association for Cities and Municipalities in Flanders |
| **HCN** | Heating and Cooling Networks |
| **WcW** | Collective Heat Act (NL) |
| **ESCO** | Energy Service Company |
| **MT** | Medium temperature Heat Network |
| **LT** | Low temperature Heat Network |
| **VLT** | Very Low temperature heat Network |
| **EUCF** | European City Facility |
| **SME** | Small and Medium-sized Enterprises |
| **BELPEX** | Epex Spot Belgium |
| **IRR** | Internal rate of return |
| **DSO** | Distribution System Operator |

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

## TABLE OF CONTENTS



Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

## GERENAL INTRODUCTION

The TANDEMS pilots hold a pivotal role within the TANDEMS project, serving as implementers and validators of the various tools, models, approaches, and trainings developed across different work packages, namely:

- The TANDEMS pilots hold a pivotal role within the TANDEMS project, serving as implementers and validators of the various tools, models, approaches, and trainings developed across different work packages.
- The Open Collaboration Model (D2.1) was used as a basis for the set-up of the Neighbourhood Renovation Hub within ZuidtrAnt. With each new Neighbourhood Renovation Hub, ZuidtrAnt set up a team based on the Open Collaboration Model. The specific case of the Neighbourhood Renovation Hub within the municipality of Schoten is the best example. After some discussions with the original partners of the team, specialized contractors were added in the collaboration model to tackle strict renovation regulations hands on.
- The municipalities of Gabrovo and Burgas also used this established model to set up the collaboration between both municipalities and partner EnEffect.
- Business models (D2.2): Within the framework of Tandem meetings – including inspiration sessions and consortium meetings - the shared examples and experiences related to the ‘cost price model’ proved particularly valuable for the Bulgarian partners. Moreover, during the establishment of the energy community, the support from the partners on citizen engagement strategies (D 4.1) was instrumental in successfully involving the members in the activities of the community, fostering engagement and organising joint meetings.
- Open collaboration model:  This model fosters knowledge sharing, innovation, and co-creation, often without any single party having exclusive control.
- Business models (D2.2): Within the framework of Tandem meetings (inspiration sessions and consortium meetings) the examples and experience regarding the functioning of the "cost price model" were extremely useful in the case of the Bulgarian partners. In addition, during the establishment of the community, the support from the partners with regards to citizen engagement approach (D4.1) was extremely valuable, regarding the inclusion of the members in the activities of the community members in the activities of the community, their engagement and holding of joint meetings.

The successful execution of viable and innovative community energy projects is instrumental in determining the project's overall success and impact. However, the complexity of developing these projects lies to a large extent in the ability to deal with and/or challenge the existing energy regime and associated structures, practices and mental models. In the TANDEMS project, reflexive monitoring was implemented to support the pilot projects in identifying and addressing systemic challenges within existing energy regimes. This approach enabled the pilot projects to reflect on their experiences, adapt their strategies, and drive transformative change. To facilitate reflexive monitoring, several tools were introduced throughout the project.

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

- Learning history workshops were organized to map key events in the pilot projects on a timeline, identifying both enablers and obstacles. Reflecting on these pivotal moments provided valuable insights into the factors contributing to success or failure, helping to define and monitor future actions. Additionally, the systemic iceberg model was applied to uncover deeper, second-order learning questions that drive transformative change. By analyzing underlying trends, structures, and mental models, pilot projects could gain a better understanding of the root causes of challenges and identify opportunities for systemic change.
- Through policy dialogues, various stakeholders—including the pilot partners—gathered insights and action points aimed at improving the current situation and working methods.

To further disseminate insights, eye opener workshops were conducted to share lessons learned from the pilot projects. These workshops used narratives to communicate key findings, allowing participants to collaboratively reflect on the most impactful lessons. Through this process, they explored ways to replicate successes, scale up innovations, and overcome challenges. By systematically recording, analysing, and sharing learnings, the TANDEMS project fostered continuous improvement and encouraged the broader application of insights, strengthening the impact and scalability of community energy projects.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

# 1 INTRODUCTION

## 1.1 WHY THE HEAT TRANSITION IS ESSENTIAL FOR EUROPE

**Figure 1:** Heat network “Warmte Verzilverd” – © Regine Mahaux

The heat transition is a crucial pillar of Europe’s energy transition. Heating and cooling account for roughly half of Europe’s total energy consumption, and the majority of this is still generated using fossil fuels such as natural gas and heating oil. This not only results in significant greenhouse gas emissions but also makes Europe dependent on geopolitically uncertain energy imports.

By shifting to sustainable heat sources such as waste heat, geothermal and aquathermal energy, individual sustainable heating solutions or district heating networks, we can drastically reduce $CO_2$ emissions while making our energy supply more secure and affordable. Moreover, the heat transition contributes to a fair and inclusive energy transition: by promoting collective and local heating solutions, households and businesses gain access to a stable and sustainable heat supply without being subject to volatile fossil fuel prices.

The challenge is great, but so are the opportunities. With smart innovations, strong policy measures, and citizen initiatives, we can accelerate the heat transition and build a sustainable, energy-independent future for Europe.

## 1.2 OBJECTIVE OF THE DELIVERABLE

This deliverable provides policymakers, energy communities and other stakeholders with concrete insights into how to shape an efficient and equitable heat transition. The results can help develop strategic guidelines for both individual and collective heat solutions and contribute to an accelerated phase-out of fossil fuels in the built environment across Europe.

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

# 2 THE GENERAL FRAMEWORK

This chapter outlines the essential building blocks for a successful and equitable local heat transition. It positions municipalities as pivotal “local directors”, with a unique understanding of the local context and the ability to coordinate stakeholders, policies, and resources.

To fulfil this role effectively, however, municipalities require structural support, from financing tools like development funds to national guidance and policy alignment.

A second key element is citizen ownership. By involving residents directly—both as co-investors and decision-makers—projects gain local legitimacy, broader support, and long-term resilience. Additionally, the chapter addresses the need for transparent pricing and regulation in what is often a natural monopoly setting.

Finally, the concept of local heat plans is introduced as a strategic instrument for mapping demand, sources, and suitable heating solutions. These plans must be technically sound, socially inclusive, and future-proof—able to respond to shifting policies, technologies, and climate goals. Through zoning, careful source planning, and adaptable infrastructure, municipalities can pave the way for collective, sustainable, and affordable heat networks.

**Sources used for this section:**

- https://www.vlaanderen.be/publicaties/warmtegids-praktisch-naar-succesvolle-toekomstgerichte-projecten
- https://www.nplw.nl/

## 2.1 LOCAL DIRECTORS

Municipalities can be considered local directors in the local heat transition. Besides a European, national and regional framework that sets the direction, municipalities have a crucial role to play. They know the local situation and see where opportunities exist to replace fossil fuels. Moreover, municipalities are in close contact with local players and have the best insight into initiatives and the wishes and concerns of building owners and users.

To this end, local authorities have the right national or regional support. Besides the right powers and implementation capacity, they also need the resources to make the measures feasible, affordable and equitable for the whole of society.

### 2.1.1 Resources or support

To implement the heat transition, municipalities need resources to provide sufficient implementation capacity of their own or to attract external capacity. In addition, they need to be supported nationally by specific knowledge or interest groups (such as, for example, the Association for Cities and Municipalities in Flanders VVSG) that can help set out an overall strategy.

Co-funded by
the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

A wide range of individual subsidies and financing instruments for residents and building owners is also necessary to make their building or neighbourhood more sustainable. For example, a heat fund can be set up where homeowners can take out an interest-free loan for insulation works or works needed to achieve collective or individual fossil-free heating.

Besides these individual subsidies, consideration should also be given to pre-financing development costs for a collective heat/cool network. From the initial idea, to making a feasible business case and finally convincing potential customers, all these steps require a lot of commitment and study. Not only from professionals, but also from local volunteers; and all this before even one shovel has been put into the ground. This is why a national development fund for cooperative or citizen-led HCN (Heating and Cooling Networks), as is also applied in the Netherlands, is a gigantic lever for the eventual realisation of projects in practice. If a project eventually comes to fruition, the project owner has to repay the development costs that were pre-financed to the development fund. If the project proves unfeasible, the development costs are still largely covered for the promoter.

### 2.1.2 Citizen ownership

The realisation of a heat network can be partly co-financed with citizen capital. This makes citizens co-owners of the assets and this local ownership has several advantages, both economic and social.

**Figure 2:** ZuidtrAnt community guided tour

*Economic benefits*

- Lower financial risk: Raising capital from citizens rather than from banks or large investors reduces reliance on debt financing. This makes projects more financially robust.

This project has received co-funding from the European Union's Life programme under grant agreement No 101077514

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

- Retention of value in the region: Project proceeds flow back to the local community rather than to external investors. This stimulates the local economy.
- Long-term focus: Citizens as investors often have a longer-term vision than commercial parties, which promotes sustainable growth and stability.
- Higher chance of funding: Banks and institutional investors only fund up to a certain percentage. Citizen capital can be the difference in making a project feasible and financially complete.

*Social benefits*

- Increased involvement and support: When citizens are co-owners, they feel more connected to the project. This can reduce resistance and increase the chances of success.
- Democratic decision-making: Local ownership gives citizens a say in the choices made, making projects more responsive to local needs.
- Distribution of wealth: Instead of centralising profits with a few big players, they are distributed more equitably across the community.
- Strengthening local resilience: Collective investment in renewable energy, for example, makes the region less dependent on external energy sources and price fluctuations.

*Ecological benefits*

- Sustainability focus: Cooperative projects often have a stronger focus on environmental and social values than purely profit-oriented investors.
- Faster energy transition: By getting citizens directly involved and contributing financially, renewable energy projects can be realised faster.

### 2.1.3 Market forces and pricing

As collective heat supply is often a natural monopoly due to limited market forces, it is important that consumers are protected from excessive prices.

In Denmark, for example, the initiator of a new heat project must be able to prove that this project is beneficial for the end user and that, according to a socio-economic cost-benefit analysis, it is also socially the best opportunity for heat supply in the specific area. Furthermore, heat companies in Denmark are not allowed to make a profit, and only pass on real costs in tariffs. This protects consumers from the natural monopoly of heat companies. All costs are fully transparent. In Denmark, municipalities have more far-reaching tasks. Municipalities determine the best way to heat the zone for a defined heat zone based on current and future heat demand and available sources. The regulator ensures that plans are made according to a standardised cost-benefit analysis over 20 years. They approve project proposals only if they meet all predefined criteria. Most heat companies in Denmark are cooperatively or municipally owned and citizens can participate in them and are locally oriented.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

In the Netherlands, the Collective Heat Act (WcW- 01/01/2026) states that heat companies for the supply of heat receive a public majority stake or are owned by a heat community. Under this law, the price of heat is no longer linked to the gas price and the heat sources for a heat network must be sustainable.

## 2.2 HEAT PLANS

### 2.2.1 What is a heat plan?

A heat plan is a strategic document that helps the municipality make the transition to sustainable and fossil-free heat supply. It contains an analysis of heat demand, the building stock and available local heat sources, and outlines a heat zoning map with suitable solutions for each district, such as individual heat pumps or collective heat networks. The plan provides concrete action points and policy measures to accelerate the rollout of sustainable heat. The drafting of a heat plan results in a concrete action plan and is also closely intertwined with the broader municipal policy context and should therefore be well integrated with other already familiar municipal policies such as:

- Spatial policy
- Renovation strategy
- Licensing policy
- Social policy
- Participation policy
- Own asset management and property planning

The heat transition requires a district approach and a district often does not stop or end at the municipal borders. It is therefore a good idea to coordinate heat plans regionally and possibly tackle joint opportunities.

Heat plans are best flexible, as timelines and priorities change over time. It is important to use the local heat plan as a dynamic instrument that can respond to changing circumstances in terms of technological innovation (e.g. new developments in aqua thermal energy), economic reality (energy crises driving up gas prices), policy at Flemish (e.g. tax shift, call for green heat) and European (e.g. ETS2, EED, etc.) level.

Co-funded by
the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

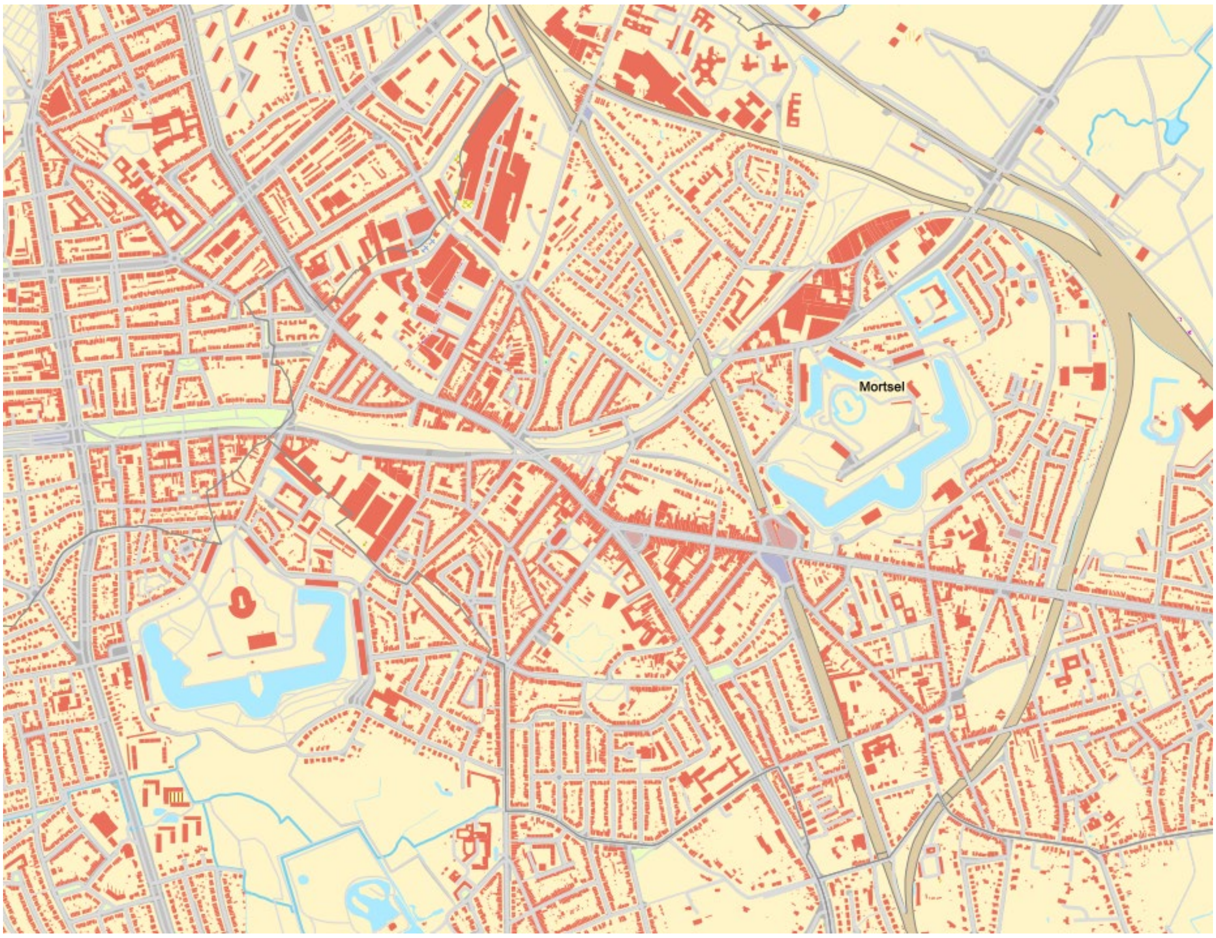


**Figure 3:** Heat map https://www.geopunt.be/shared/8ab20848-7723-e2f0-0177-b45335c503e1

### 2.2.2 Zoning

A municipality's general heat plan is based on zonings and consists of a heat zoning plan. This divides the territory into zones most suitable for specific heat solutions: collective vs. individual and shows which technologies are most suitable in which locations.

### 2.2.3 Factors playing an important role

Whether a heat network is the right choice for making an area natural gas-free depends on a number of issues.

*Dense buildings*

A heat grid is especially beneficial for dense buildings. The easiest way is to connect existing apartment buildings with a collective heating system to a heat network. The collective boiler is then replaced by a single heat connection. Multi-family homes with individual heating facilities are much more complex, as a collective piping system still needs to be provided

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

internally. For ground-level individual buildings, the costs are higher because more distribution pipes and connections have to be provided.

*A building owner*

Heat networks are collective heat systems and are often applied in neighbourhood approaches. This, therefore, requires the collective participation of a neighbourhood or area. For decision-making on the application of a heat network, it is beneficial if there is one owner of buildings that take heat, such as a housing corporation or social housing office. However, a housing corporation must have tenants' agreement in many cases. Multiple owners requires a very intensive approach to these individuals. Usually, a connection rate of at least 70% must be achieved in a neighbourhood. The fewer individual owners, the easier this percentage is to achieve. Many local heat networks are more easily realised in new housing development. The property developer and heat grid developer/operator then come to an agreement. The advantage for the project developer is that he does not have to include the financing of heat facilities in his project. The heat network operator can thus easily carry out general infrastructure works and has a guaranteed heat outlet at the new homes. Such a heat network can be properly estimated and calculated from the outset. The challenge is to future-proof it and possibly connect adjacent existing homes in the near or distant future. An ESCO will build, finance and operate the network. The developer will sell a property with a heat supply contract for a long period. The future owners enter into an agreement with the ESCO where prices, conditions, burst duration and agreements are clearly stated. The future owners usually have to pay a connection fee, fixed annual charge plus a charge for the heat consumed. The new owners are unburdened and do not have to worry about maintenance and replacement costs of the installation. If such an ESCO is not a purely commercial party but is community owned, then the residents will have the opportunity to have a say later on.

*Source availability*

The heat network requires a (sustainable) heat source nearby that will remain available in the long term. There are more sustainable low-temperature sources than high-temperature ones. A source strategy is important; in it you list new sources and think about how to lower the temperature in the future. Furthermore, there should be a supporting source that switches on during peak demand or replaces the main source if it drops out.

*Customers*

For new heat networks, there must be enough heat customers to make it profitable. For an existing heat network, expansion space is important at the heat source and at the main pipelines. The customers must match the temperature level of the heat network. For MT networks (70 °C supply heat), an energy label B for walls is sufficient. The delivery system (radiators) often does not need to be adapted. For LT and VLT networks, the right level of- and balance between-insulation, ventilation and the delivery system is important.

*Sustainability*

The sustainability of a heat network depends on the source. The heat grid is sustainable if the source is sustainable. It is important to have a long-term source strategy to meet

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

sustainability requirements by 2050. Residual heat and geothermal are low-carbon because they do not use fossil sources. Ambient and low-temperature waste heat are $CO_2$-free; however, electric heat pumps are used to get the temperature to a sufficient level for hot tap water. On-site, there are no emissions. The $CO_2$ emissions of the system are determined by the choice of electricity supply. As long as the electricity supply is not $CO_2$-free, $CO_2$ will still be emitted indirectly.
As the difference in temperature between the source temperature and the temperature of the delivered heat increases, the efficiency of the central system decreases. Alternatives for peak supply are heat storage and electric heating.

*Heat losses*
By insulating heat pipes, you reduce heat losses to the ground. Nevertheless, heat losses always occur. The higher the temperature of the heat network, the higher these heat losses are. Often, the supply temperature can be set lower in summer than in winter. We call this a heating line. If there is little heat outlet, the loss is relatively high. Therefore, the percentage of heat loss in summer is higher than in winter. To be prepared for many new connections, a large pipe is sometimes chosen. This then has more heat losses in the start-up phase.

*Heat technologies*
Various heat technologies can be used in a heat network, depending on the available sources. We distinguish between Very-Low-Temperature (VLT), Low-Temperature (LT), Medium-Temperature (MT) and High-Temperature (HT) heat networks. A heat technique can also be heat storage; there are various methods for this heat storage. We will go into this in more detail later in the technical aspects of a heat network.

*Future proof and flexible*
A future-proof heat grid is a heat system that remains flexible, sustainable and affordable even after decades. Some key features and strategies to future-proof a heat grid are:

- Flexibility and adaptability
  - Multisource design: The heat grid can receive heat from different sources such as geo- or aquathermy, waste heat, solar boilers or heat pumps. This avoids dependence on a single energy source.
  - Temperature reduction: Low-temperature heat networks ($4^{th}$ and $5^{th}$ generation) can work more efficiently with heat pumps and renewable sources, reducing energy losses and making it easier to connect homes. They can also provide cooling in summer in some cases. So they can be used for a dual purpose, providing extra comfort in southern regions and during heat waves in other parts of Europe.
  - Scalability: A modular design allows expansion without major infrastructure changes. This is crucial if new neighbourhoods or industries want to connect.
- Sustainability and $CO_2$ reduction
  - Fossil-free from the outset: By relying directly on renewable sources such as waste heat, geothermal and aquathermy, we avoid dependence on gas-fired backups.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

   - Smart storage techniques: Seasonal storage (such as heat batteries or underground water buffers) can retain surplus heat from summer for winter.
   - Efficient transmission and insulation: A well-insulated heat grid prevents energy losses and reduces operational costs.

- Affordability and accessibility
   - Local ownership: A cooperative model allows citizens to become co-owners and have a say, leading to fair prices and broad support.
   - Gradual roll-out: Starting with large customers (such as businesses, healthcare institutions or public buildings) or a large project development can help keep costs down and lay a foundation for expansion into homes.
   - Financial support and policies: Governments and local initiatives can contribute with grants and advantageous loans.

Co-funded by the European Union

This project has received co-funding from the European Union's Life programme under grant agreement No 101077514

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

# 3 TECHNICAL AND ECONOMIC ASPECTS OF HEAT GRID CONSTRUCTION

This chapter explores the technological and economic foundations of heat network development. It compares medium-temperature (MT) and low-temperature (LT) heat grids, each with distinct infrastructure requirements, energy efficiencies, and implications for building adaptation. While MT networks can serve existing buildings with minimal retrofitting, LT networks are best suited to new or well-insulated constructions and may also enable passive cooling.

The chapter also presents a range of sustainable heat sources -from geothermal and aquathermy to bioenergy, residual heat, and solar heat- each with specific technical characteristics and spatial prerequisites. These sources determine not only the design of the network but also its long-term sustainability and resilience.

Together, these technical and economic insights are crucial for municipalities, developers, and energy communities aiming to build future-proof, cost-effective and low-carbon heating infrastructure.

**Sources used for this section:**

- https://www.vlaanderen.be/publicaties/warmtegids-praktisch-naar-succesvolle-toekomstgerichte-projecten
- https://www.nplw.nl/

## 3.1 HEAT TECHNOLOGY

### 3.1.1 Medium-temperature and high-temperature heat networks

In a medium- to high-temperature heat grid (MT heat grid), the temperature of the heat source is high enough to supply water of around 70 °C to homes. Such a heat network can also supply hot tap water. Buildings connected to an MT heat network no longer need a gas connection.

**Output temperature 70 °C**

An MT heat network delivers heat with a temperature of around 70 °C to the buildings. This is lower than the temperature of most current heat networks, which often have a delivery temperature of around 90 °C. It is expected that 70 °C will become the standard, as this will make it easier to connect renewable sources. To connect existing homes to a heat network, you need to make a number of adjustments in the home. For instance, the central heating boiler is now usually in the attic, but the heat network enters on the ground floor. There must also be room in the house for installation of a delivery set. As the name suggests, this installation delivers heat from the heat network to the house.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

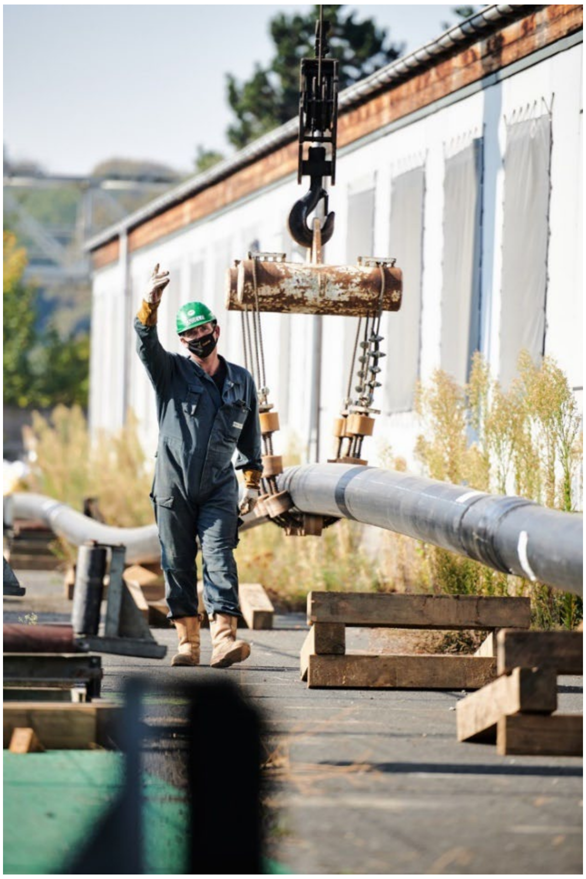

**Figure 4:** Heat network "Warmte Verzilverd" – © Regine Mahaux

**Large-scale application**

An MT heat network is a collective strategy and can really only be applied on a large scale. As many buildings in a neighbourhood as possible should be connected to achieve a cost-effective project.

**Limited insulation measures**

As mentioned, an MT heat network releases heat at around 70 °C. Therefore, you don't usually need to replace existing radiators. Limited insulation measures are sufficient to get a building warm and achieve the desired comfort. This strategy is therefore usually suitable for poorly insulated houses and historically valuable properties where no external insulation is desired.

**Heat grid infrastructure**

The construction of the heat grid is the largest infrastructure intervention required for this strategy. The cost of this varies by location. These costs are determined by subsurface crowding, soil type and crossing barriers such as water and highways, among others. When a neighbourhood switches to a heat grid and the gas grid disappears, all homes switch to electric cooking. In some cases, this may result in the grid operator having to reinforce the electricity grid. It is, therefore, important to involve the grid operator in the planning process.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

### 3.1.2 Low-temperature heat grid

In a heat grid with a low-temperature source (40-50 °C), the source has too low a temperature to heat buildings directly or provide hot tap water. The water temperature must, therefore, be raised collectively or individually in the building itself. This temperature increase can often be carried out on a somewhat smaller scale, which is not the case for a heat network with a medium- and high-temperature source. Therefore, you can combine a low-temperature heat network (LT heat network) within 1 neighbourhood with other strategies.

How and when to best deploy a LT heat network depends on the local situation. Collective upgrading with a heat pump to mid-temperature (around 70 °C) costs a lot of electricity, but modifications in the houses are then kept to a minimum. If the supply temperature from the heat network is high enough for space heating (around 50 °C), only a booster heat pump is needed for hot water supply. In that case, electricity consumption is lower. However, more adjustments are then needed in the houses and buildings, such as making the radiators suitable.

**Figure 5:** Heat network Averegten

**Building measures**

A low-temperature heat grid is most suitable for heating newly built homes or very well-insulated homes. Often, a low-temperature network can also be used for passive cooling in the summer, depending on which source is used.

The heat delivery system must be suitable for low-temperature heating. Because water is delivered at a lower temperature, a radiator needs more power to comfortably warm a room. Regular radiators should therefore usually make way for other radiators or underfloor heating.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

For the supply of domestic hot water: a booster heat pump for 50°C output is needed. An extra boiler vessel can be capable of storing domestic hot water.

## 3.2 HEAT SOURCES

A heat network needs a heat source to provide heat to connected customers. There are different types of heat sources that range from heat from water to heat from industry or from the earth. The different types of heat can be used for different applications.

### 3.2.1 Geothermal heat (geothermal)

Geothermal heat is the use of heat from ground to heat homes, buildings and light industry. Geothermal heat is also known as geothermal energy. A distinction is made between shallow geothermal and deep geothermal, based mainly on the depth of heat extraction and the associated temperature of the heat extracted.

- Shallow geothermal:
  - Depth: Up to about 500 metres below the earth's surface.
  - Temperature: The temperature in these layers is around 10-12°C and increases by about 3°C per 100 metres depth.
  - Application: These relatively low temperatures are suitable for heating and cooling buildings via heat pump systems. In summer, heat can be stored in the soil to be used for heating in winter, and vice versa for cooling.
  - Systems: There are both open systems, such as thermal energy storage (CHP), where groundwater is pumped up and returned, and closed systems, such as ground heat exchangers, where a closed circuit in the ground is used for heat exchange.

- Deep geothermal:
  - Depth: From about 500 metres to several kilometres deep.
  - Temperature: At these depths, temperatures can range from 80°C to more than 150°C, depending on location and depth.
  - Application: The higher temperatures make deep geothermal suitable for directly heating buildings, supplying heat to industrial processes and, at very high temperatures, for electricity generation.

### 3.2.2 Aquathermy

Aquathermy is the heating and cooling of buildings by using heat and cold from surface water, wastewater or drinking water. If necessary, the heat from the water is stored in the ground and then further heated with a collective heat pump, or with a heat pump per building. The heat from aquathermy flows to buildings via a heat network. A collective heat pump heats the water to a temperature suitable for space heating or hot tap water. There are aquathermy projects with individual heat pumps. Water then flows through a source network with a very low temperature (10-20 °C) to the houses. Each home has its own heat pump that heats the water to a suitable temperature for space heating.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

### 3.2.3 Bioenergy

You can heat water by burning solid sustainable bio feedstock, such as wood pellets, wood chips, liquid bio feedstock and biogas. A block or district heating network delivers this water to buildings for space heating and hot tap water. The biogas feedstock replaces fossil fuels such as natural gas. Bioenergy is a flexible source, especially in combination with a hot water buffer. The system supplies heat immediately, regardless of day and night rhythm, weather or season.

### 3.2.4 Residual heat

Residual heat is heat released from an industrial production process that can no longer be used economically. Without connection to a heat network, this amount of heat is discharged into surface water or the air. Large industry has large amounts of residual heat with a usable temperature level to heat greenhouses, buildings and tap water. Data centres, cold stores and supermarkets also have this heat to a lesser extent.

**Figure 6:** Heat network “Warmte Verzilverd”

Residual heat has a strict definition from European regulations. It is “unavoidable heat or cold generated as a by-product in industrial or power generation facilities or in the tertiary sector, which would end up unused in air or water without connection to a district heating or cooling system, when a cogeneration process has been or will be used or cogeneration is not feasible.” Residual heat is also known as waste heat, not to be confused with heat from waste incineration.

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

### 3.2.5 Solar heat

Solar heat is the harnessing of the sun's energy for heat. You can use solar heat on a small scale for hot tap water or space heating; or on a large scale for a heat grid or an industrial process. Solar heat is almost always applicable: from individual, to small collective (flat or block of flats) to large-scale collective (district-level heat grid). Because solar heat has a variable supply (day-night and summer-winter), thermal storage and an after-heater are needed for periods with less or no solar radiation. This way, the collector can always deliver the desired temperature.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

# 4 HEAT NETWORKS | GENERAL OBSERVATIONS AND LEARNING BY DOING

This chapter synthesises key insights from practical experiences with local heat planning and pilot projects in Belgium. It begins by summarising lessons learned from municipalities supported by VVSG, highlighting the importance of policy integration, spatial planning tools, flexibility, internal communication, and structured citizen participation. These elements are crucial to designing heat plans that are not only technically feasible but also socially and politically supported.

The chapter then turns to two concrete Tandems pilot projects -Warmte Verzilverd and Warmtenet Averegten- which offer valuable learning on stakeholder cooperation, ownership models, technical implementation, and pricing strategies. Both cases underscore the importance of strong local partnerships, early engagement with municipalities and citizens, and open, transparent business models.

Through these real-world examples and reflections, the chapter underlines that developing inclusive, future-proof heat networks is as much a social endeavour as it is a technical one.

**Sources used for this section:**

- www.vvsg.be
- https://assets.vlaanderen.be/image/upload/v1722332286/Warmtekaart_2024_-_rapport_definitief_bgmq3z.pdf
- https://www.vlaanderen.be/publicaties/warmtegids-praktisch-naar-succesvolle-toekomstgerichte-projecten
- https://www.nplw.nl/
- https://www.energiesamen.nu/
- https://www.energiesamen.nu/nieuws/3584/het-warmtebod-de-aanjager-voor-de-warmtetransitie

## 4.1 GENERAL OBSERVATIONS

### 4.1.1 Lessons Learnt from Local Heat Plans (VVSG)

In Flanders, the Association for Cities and Municipalities of Flanders (VVSG) guided a number of local authorities / municipalities with the drafting of a heat plan. In this section, we will present a summary of some of their key lessons with valuable input from other partners. (Annex 4)

**Policy Integration**

- Incorporate heat plan results into municipal policies (e.g., spatial planning, permitting processes).
- Align interim reporting of the heat plan with municipal reporting cycles (e.g., Covenant of Mayors).

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

**Figure 7:** Diagram Local Heat Plan VVSG – LEKP

**Spatial Planning Tools**

- Use heat zoning plans as a 'policy-desired development' to guide permitting decisions.
- Apply heat zoning plans as the basis for urban planning regulations and spatial implementation plans.
- Combine planning regulations with building regulations to create a coherent permitting framework.
- Label innovative heat projects as "pilot projects" in environmental permits to prevent automatic future approvals based on precedents.

**Flexibility**

- Local heat plans should be adaptable to changing data, technological innovations (e.g., aquathermy), economic shifts, and evolving policies (regional, national, and EU-level).
- The plan serves multiple functions:
    - A visualization and coordination tool for municipal departments.
    - A foundation for policy instruments (e.g., regulations, subsidies, group purchases, communication strategies).
    - A practical execution framework avoiding unnecessary complexity or procedural delays.
- The theoretical potential of heat sources (e.g., geothermal energy, residual heat) may differ from practical feasibility.
- Heat plans should account for future expansions; one larger installation is often more efficient than multiple smaller ones.
- Reserving drilling sites, river segments, or sewage collectors for specific zones can optimize energy use but may risk underutilization.

**Communication & Trust**

- Internal communication and coordination are as crucial as technical research.
- Organize local brainstorming sessions and knowledge exchanges to build trust and support.
- Manage expectations by aligning internal stakeholders and politicians with realistic assessments.
- Engage political decision-makers early.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

- Link the heat plan with broader goals like mobility and climate adaptation.

**Participation**

- A structured participation process is necessary when heat plans transition into policy plans, concrete projects, or legal/financial instruments.
- In the planning phase, focus on engaging internal departments and key organizations.
- General public communication about the heat plan is recommended.

**Figure 8:** Diagram Participation VVSG - LEKP

**Regional Cooperation**

- Collaborate with neighbouring municipalities, intermunicipal organizations, and provinces to develop a **Regional Spatial Energy Strategy**.
- Ad hoc cooperation can be based on cross-border opportunities or prior successful collaborations.
- **Pros:** Shared resources, knowledge exchange.
- **Cons:** Larger municipal collaborations may reduce internal involvement from officials and local stakeholders.
- A joint heat plan could be a stepping stone towards an intermunicipal spatial policy plan.

### 4.1.2 Responsibilities in the construction and operation of heat networks

In a heat network, there are 3 major components and responsibilities: the heat source, the distribution network and the heat supplier.

The biggest risks are on the source and off-take side. Once the network itself is in the ground, essentially not much can happen to it. The heat source may be subject to licensing or market conditions or environmental influences. On the off-take side, customers' payment problems can create a risk. To build a stable business case, risks must be able to be spread throughout the project. Therefore, if different roles are assigned in a heat project with different responsibilities, there is a danger that the greatest risk will fall on one party, potentially jeopardising the overall project.

Co-funded by the European Union

This project has received co-funding from the European Union's Life programme under grant agreement No 101077514

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

Existing distribution network operators (DSOs) of electricity and gas networks see themselves as an ideal party to also appropriate the role of distribution network operator of heat networks. Understandable in itself, but potentially this does jeopardise the acceleration needed in the heat transition. Therefore, open accounting within heat network partners or consortium formation between partners within 1 project is a possible solution so that all costs and benefits can be shared equally. Involving local authorities or energy communities in the operation of heat projects also makes it a future-proof energy transition.

## 4.2 PILOT HEAT NETWORK “WARMTE VERZILVERD”

### 4.2.1 General information

- Total project cost: 5,3 million euro
- Source: industrial residual heat – high temperature heat network
- Connections: 360 households (new housing developments) – 4 SME’s

### 4.2.2 Preliminary process

In 2017, the province of Antwerp commissioned VITO (Flemish Institute for Technological Research) to conduct a study on the potential of using industrial residual heat as a source for heat networks to heat homes. This study showed that the industrial site of AGFA Gevaert (imaging) had a large residual heat potential and could possibly be an interesting source due to its location (in the middle of residential areas).


**Figure 9:** Heat network “Warmte Verzilverd”

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

At the same time, in Edegem, the neighbouring municipality, an old site of the same AGFA Gevaert was being remediated and plans were being made there for a large residential development (about 360 residential units). Also along the other side of the site, in Berchem (a district of the city of Antwerp), there were plans to convert an old part of the historical plant into a residential zone. These factors brought the municipality of Edegem and cities of Mortsel and Antwerp together to take the initial potential study further to a real feasibility study. Together, they provided funding for this and appointed a study agency (Kelvin Solutions) through a tender process. They also put together a project team with relevant officials, aldermen and also the distribution system operator (DSO) Fluvius. The feasibility study showed that the residual heat potential could be very useful for the 2 planned residential developments and that building a heat network could become financially viable, provided a number of other major customers joined.

### 4.2.3 Influencing factors

- The feasibility study showed that a subdivision of AGFA Gevaert (AGFA 4), located next to the new development in Edegem at 500 metres as the crow flies from the site where the heat is produced, also had a large consumption of heat. This heat was still provided using a gas boiler that was in urgent need of replacement. As a result, they did not have to invest in a new gas boiler themselves and AGFA Gevaert could supply their department CO2-free with its own residual heat.
- The study agency contacted the local citizen energy cooperative ZuidtrAnt (enegy community) to present the study and its potential. They showed immediate interest in investing in it and helping to spread the project to citizens.
- The project developer in Edegem (Revive) had the ambition to build natural gas-free and use circular construction techniques as much as possible.
- The allotment permit issued by the municipality of Edegem stated the following: the homes should be connected to the heat network, if available, or heated with sustainable heat.
- The DSO (distribution system operator) Fluvius saw no advantage in a possible business case for this heat network and ultimately did not want to participate.

### 4.2.4 Construction of ‘Warmte Verzilverd’ heat network

- Study agency Kelvin solutions, citizen energy cooperatives ZuidtrAnt-W and Ecopower took the initiative to build the first heat grid fed with industrial residual heat to heat homes. To this end, they jointly founded the company ‘Warmte Verzilverd’, which is more than 85% co-owned by local citizens.
- ‘Warmte Verzilverd’ received permission from the municipality of Edegem and the city of Mortsel to lay pipes in their public domain (domain transfer).
- Because this heat network was constructed for a large new-build project with mandatory connections, it could come into realisation very quickly. The necessary participation process to convince citizens to connect did not apply here, allowing realisation to proceed very quickly.

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

- Eventually (after realisation of all project phases), around 360 residential units and 4 SMEs will be connected to the heat network. The greatest weight of heat uptake is at the SMEs.
- In the middle of the covid-19 lockdown, a working heat network was realised, with directional drilling of 2 major traffic axes, the construction of a heat distribution plant , the connection of the 4 SEs and the laying of 2 pipeline routes suitable for a high-temperature heat network in 9 months speed.
- The operation and administration of the heat grid is fully owned and fully developed by 'Warmte Verzilverd'.
- Pricing is set as follows:
    - a fixed connection fee, which covers part of the costs of the connection, delivery set and pipeline network;
    - an annual fixed contribution fee, which covers maintenance, administration and replacement costs;
    - an annual contribution for effective heat consumption, which is broken down into monthly bills.
    - In this project, the 'no-more-than-otherwise' principle is used, based on 2019 gas prices (before the energy crisis) and a fixed price (indexation only) is charged, independent of the fluctuating gas price on the energy market.

### 4.2.5 Future plans

The 'Warmte Verzilverd' partners do not shy away from any challenge. They were awarded an EUCF study by the city of Mortsel, allowing them to explore the possibilities of expanding to existing homes. Provided a minimum profitability, 70% connection rate and support from Flemish subsidies (both for the individual citizens and for the construction of the heat network itself), this would be a possible future scenario.

The expansion will be divided into 2 phases:

- Phase 1 involves 20-odd houses and 2 larger buildings (school and art school).
- Phase 2 comprises 170 dwellings and 1 large residential care centre. The detailed technical and financial study for the expansion is currently underway. For example, the adjustments along the side of the heat grid itself are being looked at in detail and the back-up heat source is being investigated.

The participation plan has been drawn up and the first steps in the participation process towards the neighbourhood of phase 1 have been taken. Currently, residents are being informed about the possible expansion of the existing heat grid. ZuidtrAnt is exploring their interest and willingness to think about a connection and are also discussing what modifications would be needed in their private homes to make a connection. The financial analysis and technical study of each property on its own will follow once the results of the detailed study are known.

Lastly, an expansion to an entire existing social housing estate in Edegem (80 housing units), which is undergoing energy-saving renovation, is being investigated.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

**Figure 10:** Expansion to existing housing | Heat Network “Warmte Verzilverd”


**Figure 11-12:** “The warmest street” event for the expansion to existing housing | Heat network “Warmte Verzilverd”

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

### 4.2.6 Lessons learnt

- Heat sources are crucial in the development of a district heating network. We observe that cherry-picking is widespread, with easy, cheap, and stable sources being claimed and used to build straightforward business cases. The heat transition could accelerate if waste heat producers were required to provide this source free of charge to heating projects for warming other buildings (cf. Denmark).
- Existing grid operators for electricity and natural gas are very protective of their role and are eager to take on the management role for future district heating networks as well. It is important that this attitude does not hinder or delay the rollout of new district heating systems. Therefore, an open playing field in the role of heat network operator is crucial.
- Heat supply should not fall into the hands of parties seeking solely commercial gain. Anchoring profit maximisation within a legal framework may therefore be a good option. (cf. Denmark).
- Collaborations between different stakeholders can add value to district heating projects. They allow each party to bring in their specific strengths and expertise.
- A bottom-up project that is built with maximum involvement of local residents and the neighbourhood has significant added value and a higher chance of success.
- Developing district heating networks without certainty of realisation is very costly and financially risky. A development fund for heat networks could provide a boost to the implementation of projects that are less obvious but equally valuable. (cf. the Netherlands)

## 4.3 PILOT HEAT NETWORK AVEREGTEN - HEIST OP DEN BERG

**Figure 13:** Heat network Averegten

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

### 4.3.1 General information

- Total project cost: 1,4 million euro
- Source: Geothermal heat – low temperature heat network + cooling
- Connections: 72 households (new housing development, mix apartment and houses)

### 4.3.2 Preliminary process

- The engineering company appointed by a property developer, contacted ZuidtrAnt to explore interest in including an ESCO assignment in the new project development.
- The local government of Heist op den Berg was in favour of a collective heat network with a sustainable heat source and advised this to the project developer when applying for the subdivision permit.
- ZuidtrAnt sought cooperation with the local energy cooperative Klimaan. In this way, expertise gained and local connection were linked.
- ZuidtrAnt and Klimaan drew up a business case to put the feasibility of this project into an ESCO principle. Affordable heat with a collective installation fuelled by a renewable source was our starting point.
- ZuidtrAnt and Klimaan provided the project developer with an example model of cooperation, our business case and a model agreement to future residents.

### 4.3.3 Construction of 'Warmtenet Averegten'

Currently, the project is still under construction and the first residential units are being sold.

- The underground pipe network has been laid and geothermal drilling has been carried out. The first occupancy is expected in 2026.
- Pricing is set as follows:
  - a fixed connection fee: this covers part of the costs of the connection, delivery set and pipeline network
  - an annual fixed contribution: this covers maintenance, administration and replacement costs
  - an annual contribution for effective heat consumption, which is broken down into monthly bills.
  - an annual flat-rate amount is charged for cooling, which can be used indefinitely during the summer months
- In this project, a 50% fixed energy price and 50% BELPEX dependent energy price has been calculated. This will be settled in the consumption invoices.
- The heat pump will be fed by the PV installation on the roof, also owned by the ESCO, is connected to its own distribution cabin connected to the distribution network.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

### 4.3.4 Lessons learned

- The municipality can be an enabling factor.
- Openness and transparency foster mutual trust. By sharing the business case, along with the associated revenues and costs, the developer gains insight into the charges applied both in the short and long term. Since the IRR of the entire district heating project is known in this way, the developer understands why certain amounts are charged and why they are necessary. This eliminates assumptions regarding excessive profits.
- Well-structured cooperation agreements are essential so that everyone is aware of their responsibilities, preventing disputes afterwards.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

# 5 THE 'GROWING UP TOGETHER' MODEL FROM THE NETHERLANDS | DUNEWORKS & ENERGIESAMEN

## 5.1 Inspiration Session by Sylvia Breukers, Duneworks

During the TANDEMS learning sessions (led by VITO 2023-2025), challenges such as friction, resistance, non-collaboration, and non-engagement, have come up, all of which are common experiences in energy communities. These issues arise in different contexts, particularly in interactions with other initiatives, citizens, and, most notably, municipalities.

While some energy communities and municipalities have naturally strong ties, such as in Gabrovo, where the local authority and the energy community are closely linked, this is not the norm everywhere. In many cases, municipalities and energy communities do not start as natural partners. This misalignment often results in difficulties when working together on energy transition initiatives.


**Figure 14:** 'Growing Up Together' (Opgroeiruimte) diagram

In the Netherlands, the national program 'Local Heat' was launched to support local heating initiatives, with a key focus on improving collaboration between municipalities and energy communities. To support more effective public-civic partnerships, the 'Growing Up Together' model was developed by Duneworks and EnergieSamen[3]. Though originally designed for district heating projects, it can also be applied to sectors, such as food.

[3] https://www.duurzaamdoor.nl/thema/energietransitie/rol-energiegemeenschappen/opgroeiruimte

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

Unlike renewable energy projects, such as rooftop PV installations, district heating initiatives are more complex and require a higher level of coordination. Historically, Dutch municipalities found it easier to collaborate with large energy companies like Vattenfall rather than citizen-led initiatives, which claimed they could take on the task and often arguing that they could do it even better. In the Netherlands, public-private collaboration is well-established, but public-civil collaboration between municipalities and citizen initiatives remains unfamiliar and untested in many cases.

To gain insights, Duneworks and EnergieSamen conducted interviews and organized dialogue sessions involving both municipal civil servants and frontrunner energy communities. These discussions took place in three cities: Zwolle, Zutphen, and Amsterdam. Each of these cities has ambitious citizen-led district heating projects that explore innovative energy sources, such as extracting heat from the IJssel river or city canals in Amsterdam.

A notable example from Amsterdam involves a citizen initiative that recently secured financing to move forward with a district heating project. The municipality acted as a guarantor for a public bank loan, demonstrating a significant level of trust and commitment to the initiative. However, this trust was not easily achieved but resulted from years of struggle, negotiation, and relationship-building.

The study identified several essential factors that contribute to a successful partnership between municipalities and energy communities:

- **Getting to know each other**: one of the most fundamental steps is simply taking the time to build relationships and develop mutual appreciation. In Zwolle, a community of practice was established to facilitate open conversations between the municipality and the energy community. To encourage constructive dialogue and lighten the tone, they even incorporated elements of theatre play into their meetings. This initiative resulted in a document, 'The Commedia of Zwolle', which openly addressed and challenged the prejudices held by both civil servants and community members.
- **Working together practically**: beyond discussions, collaboration must be put into practice. Engaging in joint projects is one of the best ways to build trust and establish a shared sense of responsibility. In Zutphen, the municipality and the local energy cooperative conducted a joint feasibility study for a district heating project. This effort helped reinforce their partnership and ensured that both sides gained a common knowledge base. Similar collaborative efforts were observed in Amsterdam.
- **Securing partnerships through agreements**: formalizing collaboration through agreements helps create clarity and continuity. In the Netherlands, partnership development typically follows a structured process: first, an agreement of intent is signed. Later, a more detailed partnership agreement is established. These agreements define roles, responsibilities, shared values, risk management, and decision-making structures. For example, in Zutphen and Amsterdam, partnership agreements played a crucial role in strengthening collaboration by clarifying expectations. In Amsterdam, the 'Meer Energie' initiative initially struggled with an overwhelming number of municipal meetings which was unsustainable for a citizen-led cooperative. Through a partnership agreement, they

DuurzaamDoor - YouTube

Co-funded by the European Union

This project has received co-funding from the European Union's Life programme under grant agreement No 101077514

established a more feasible meeting structure, ensuring their time was valued and that they were taken seriously as partners.

- **Developing a shared story and vision**: a common mission and vision provide long-term direction and motivation. In Zwolle, the theatre-inspired activities helped foster a collective narrative. In Amsterdam, 'Meer Energie' and the municipality co-developed scenarios for the district heating project, even though the cooperative already had a clear vision. The process of creating these scenarios together helped establish a shared language, a unified vision, and a stronger working relationship.

Despite these best practices, numerous challenges and sources of friction were identified:

- Civil servants often question who energy communities truly represent. Are they a credible voice for citizens? Conversely, energy communities face similar doubts about municipal officials, who frequently change positions. If a civil servant makes a promise, how reliable is it? Making these concerns explicit and discussing them openly can help address scepticism.
- The role of professionals within citizen-led initiatives is often unclear. Are they volunteers, or are they seeking paid positions? Should municipalities compensate energy cooperatives for work such as citizen engagement? Addressing these questions upfront helps avoid misunderstandings.
- Staff turnover within municipalities and energy cooperatives can disrupt projects. Establishing clear mandates, respecting different work cultures, and defining decision-making processes can help maintain stability.
- Both municipalities and energy communities struggle with financial stability. A major issue in the Netherlands is the stop-go funding dynamic, where funding is provided in phases based on progress assessments. This uncertainty makes long-term planning difficult. Innovative public procurement models and milestone-based financing can be explored as possible solutions.

As demonstrated in the two heat-network pilot in Belgium, one of the biggest obstacles in achieving successful public-civic partnerships is making the time to discuss how to work together effectively. Addressing friction points explicitly, building structured collaborations, and establishing mutual trust are all crucial for long-term success.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

# 6 REFLECTIONS ON COMMUNITY-OWNED HEAT NETWORKS

The development of community-owned heat networks represents more than just a technical or economic challenge — it is a social and systemic transition. Throughout these TANDEMS pilots, we have explored the complex interplay of stakeholders, legal frameworks, technologies, and community dynamics that shape the success of heat network projects.

From the pilot cases in Belgium (by ZuidtrAnt and Klimaan) to the 'Growing Up Together' model in the Netherlands (by Duneworks), one message resonates clearly:

**“Collaboration, transparency and local ownership are the cornerstones of a just and resilient heat transition.”**

By enabling citizens, municipalities, and energy communities to co-develop and co-own heat infrastructure, we not only unlock innovative technical solutions, but also build the democratic and social foundations needed for lasting impact. The experiences from ZuidtrAnt, Klimaan and inspiring initiatives from the Netherlands show that successful projects are rooted in trust, clear roles, shared language, and realistic, cost-covering business models.

As we move forward, it is essential to maintain this momentum, to create space for experimentation, to institutionalize support structures like development funds, and to anchor fairness in pricing and participation through thoughtful regulation. If we want heat to remain affordable, sustainable and accessible for all, then citizen-driven and municipally supported models must be seen not as alternatives, but as central pillars of our energy future.

The journey is complex, but the tools are within reach. Now is the time to scale, replicate, and refine — together.

Co-funded by the European Union

*This project has received co-funding from the European Union's Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*

# 7 LIST OF ANNEXES

See zip folder for annexes

## ANNEX 1: SIMPLE FEASIBILITY ASSESSMENT HEAT GRID | EENVOUDIGE HAALBAARHEIDSINSCHATTING WARMTENET

This calculation tool allows you to make a simple feasibility assessment for a small-scale low-temperature district heating and cooling network based on geothermal energy (borefield). The tool was developed for the pilot project “Warmtenet Averegten”.

## ANNEX 2: INVITATION WARMEST STREET | UITNODIGING WARMSTE STRAAT

This invitation was delivered door to door to the residents of the street where ZuidtrAnt is exploring a possible extension of the "Warme Verzilverd" district heating network.

## ANNEX 3: TIMELINE PARTICIPATION TRAJECTORY | TIJDSLIJN PARTICIPATIE TRAJECT

This timeline was created by and for the partners of "Warmte Verzilverd" to provide an overview of the participation process needed to prepare for the expansion of the district heating network.

## ANNEX 4: LESSONS LEARNED FROM LOCAL HEAT PLANS | LEERLESSEN LOKALE WARMTEPLANNEN

This note is based on the VVSG guidance trajectories for developing local heat plans (2022–2024), with valuable input from the Province of Limburg, IOK, Leiedal, and participants of the "100 Neighbourhoods" platform (see the harvest note here). It highlights lessons learned that are not included in the standard local heat plan format or the heat cluster analysis guide.

Co-funded by the European Union

*This project has received co-funding from the European Union’s Life programme under grant agreement No 101077514*

*Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.*