Covenant of Mayors
for Climate & Energy
EUROPE

THE Cities Heat Detox

HEALTHY HEAT
FOR CITIES

CAMPAIGN OVERVIEW

JUNE 2024-JUNE 2025

#HealthyHeat4Cities #CitiesHeatDetox

An Initiative of the European Commission

The Cities Heat Detox

The way we heat today, by burning fossil fuels, is detrimental to our environment, our health, and our society. Fossil-fuelled heating, representing 72% of buildings' heating in Europe today, contributes to climate change, energy insecurity and deteriorated air quality. There is no doubt: for a healthier and more secure future, our cities need a comprehensive cleansing of toxic heat sources.

Cities have the potential to make a big difference. Through effective heat planning and the expansion of collective solutions like decarbonised district heating, local governments can phase out gas in their heating on a large scale.

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Overview

The campaign gathered a total of **55 case studies** on heat decarbonisation strategies and projects in cities.

- The EU Covenant of Mayors Office developed **31 case studies**.
- We connected **10 external case studies** to our map through 7 of our campaign partners (Euroheat&Power, Solar Heat Europe, EGEC, NetZeroCities, Committee of the Regions and Plus Fraiche Ma Ville).



- **2 case studies** were submitted directly by cities: Ghent and Växjö.
- **11 case studies** were submitted via the Award application.

The case studies cover **22 EU countries** and **2 non-EU countries** (Iceland and Ukraine).

The case studies represent:

- **27 big cities**, with a population above 250 000 inhabitants
- **22 medium-sized cities**, with a population of 50 000 to 250 000 inhabitants
- **6 small cities**, with a population of less than 50 000 inhabitants

The campaign cities included:

- **25 cities** that are part of the **Mission** for climate neutral and smart cities by 2030
- **9 cities** that are past, current or future **Green Capital** or **Green Leaf** winners

Of the case studies, **30 outline the overall strategy** of the city and municipality, with **5 that focus in on specific projects** in addition to giving a general overview. Although not all of these point to their heat plan, it is safe to assume that they have developed some sort of heat plan or strategy.

The other **25 case studies** outline very specific heat decarbonisation projects within the city, ranging from geothermal plants to heat recovery from data centres.

We also had one interview-article with a Covenant Supporter and regional energy agency, the **North-West Croatian Regional Energy and Climate Agency**, on their support to local decarbonisation efforts across Croatia.

Countries and Cities Covered

Country	Number of Case Studies	Cities
Austria	1	Vienna
Belgium	3	Ghent, Mechelen, Leuven
Cyprus	1	Limassol
Czech Republic	1	Prague
Denmark	2	Bjaeverskov, Silkeborg
Estonia	1	Tallinn
Finland	6	Espoo, Lappeenranta, Oulu, Turku, Vantaa, Vasaa
France	6	Angoulême, Besançon, Brest Métropole, Dijon Métropole, Lyon Métropole, Marseille
Germany	3	Heidelberg, Mannheim, Munich
Greece	4	Alexandroupolis, Domokos, Kozani, Vari-Voula-Vouliagmeni
Hungary	5	Budapest, Hungary, Miskolc, Pécs, Szeged
Iceland	1	Rejkavik
Ireland	1	Dublin
Italy	3	Bergamo, Campi Salentina, Radicondoli
Latvia	1	Salaspils
Lithuania	1	Vilnius
Netherlands	1	The Hague
Poland	1	Warsaw
Portugal	2	Guimaraes, Porto
Slovenia	3	Celje, Maribor, Velenje
Spain	2	Bilbao, Valladolid
Sweden	4	Gothenburg, Lund, Stockholm, Växjö
Switzerland	1	Geneva
Ukraine	1	Vinnytsua

In the next section we explore the different case studies through the key topics and trends that emerged across the campaign's 3-step Detox.

Please note: the cities listed under each topic are not necessarily the only ones involved; they are often just the most impactful examples. In some cases, a city may not appear because certain details were not mentioned in the case studies — this does not mean the city is not working on that topic.

Step 1. Heat Planning

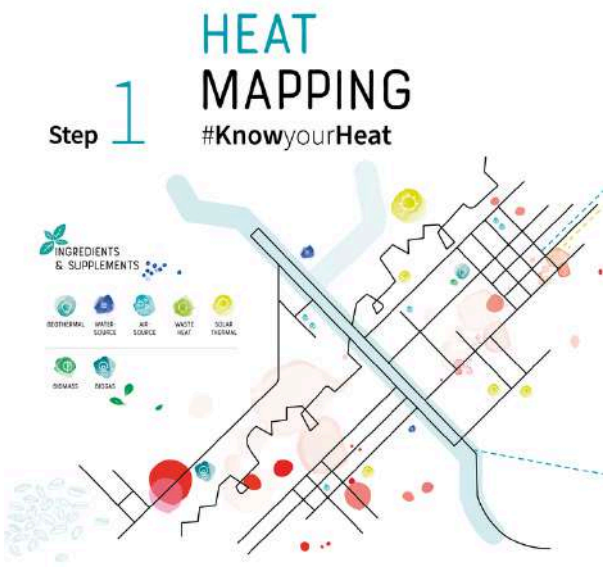
Heat planning enlightening the way forward

27 cities of the cities in the campaign stressed the importance of their heat plan for them to chart the way forward. (Note: this does not mean the other cities do not have heat plans, but they were not specifically mentioned in the case studies.)

In the German cities — **Munich**, **Mannheim**, and **Heidelberg** — heat planning was underlined as a crucial lever, serving as an essential step to identify the potential expansion of district heating networks.

For Belgian cities, where district heating is largely non-existent, planning was key to putting this option on the map. In **Mechelen**, district heating emerged as a central solution thanks to planning carried out in parallel with pilot projects — moving beyond the idea of district heating as merely a pipedream. Similarly, **Leuven**'s NetZeroCities pilot project combined planning and pilot work to determine which energy company to establish for managing district heating.

This is also a cornerstone of **Vienna**'s strategy, where pilot projects serve as testing grounds for viable technical solutions, enabling the



rollout of the most suitable measures across the entire city under their "100 projects out of gas". Vienna's heating plan also provides guidance for all owners and people living in Vienna.

Heat mapping to identify heat potential proved essential for many cities on their path to decarbonisation, as seen in **Bilbao**, where they developed a heat plan in the framework of the EU-funded DecarbCityPipes Project.

Cities such as **Munich** highlighted the importance of making heat maps and plans open to the public, using detailed and consistent databases to inform the citizens of the best heating systems for their area, which establishes a relationship of trust and understanding both with inhabitants and energy providers.

Collaborative planning was highlighted in t**he Hague**'s strategy, as well as Mechelen's. Both set up multi-stakeholder coalitions (i.e. **Mechelen**'s Heat Coalition of 25+ partners) around their heat planning process to provide advice and monitor progress.

Climate ambition accelerating decarbonisation

Another key lever at this early stage is setting **clear targets and ambitions** to drive decarbonisation forward. All Mission cities reflect this in their strategies, many of which are shaped by ambitious 2030 net-zero targets.

This drive was particularly strong in countries bordering Russia, where the energy crisis spurred efforts to accelerate the phase-out of gas. Finnish cities such as **Lappeenranta** and **Vaasa** noted this motivation, as did Baltic cities like **Tallinn** and **Vilnius**, along with several Eastern European cities.

Only a fraction of the campaign cities has an explicit "gas phase-out" ambition, including **the Hague**, **Vienna**, **Mannheim** and **Lappeenranta,** among others.

Eight cities have explicitly outlined they are aiming for a 100% renewable energy mix in their heating system on different timelines between now and 2050:

- **Turku** (2029)
- **Mannheim** (2030)
- **Tallinn** (2030)
- **The Hague** (2030)
- **Velenje** (2033)
- **Dijon Metropole** (2030)
- **Munich** (2040)
- **Vienna** (2040)
- **Mechelen** (2050)

Planning for cooling as well as for heating

Only **5** campaign cities highlighted having specifically planned for **decarbonised cooling** as part of their heat planning:

- **Lyon Métropole**: creation of one new hot-cold network among three or four new DHC networks planned;
- **Marseille**: expansion of current two hot-cool networks using sea water;
- **Munich**: new district cooling network to be developed drawing from Isar River;
- **Tallinn**: district cooling in development since 2019, to be expanded by 1 km per year;
- **Vienna**: strategy being developed to define steps for cooling.

(Note: this does not mean other cities are not planning for cooling; it simply was not highlighted in the case studies).



Step 2. District Heating (& Cooling)

District heating is one of local governments' most important tools for decarbonising heat supply at scale. After completing the first step — a comprehensive heat planning process — municipalities can identify where to **expand, develop, or refurbish** their district heating networks. This approach helps reach as many households as possible efficiently while making it easier to integrate renewable energy sources.



Leveraging existing networks

Northern European cities – in Denmark, Sweden, Finland, and Baltics – benefit from already large existing district heating networks over which municipalities have significant influence (either thanks to municipal ownership or longstanding partnerships), accelerating their decarbonisation journeys.

- **Reykjavik** (3499 km)
- **Stockholm** (3000 km of district heating and 300 of district cooling)
- **Växjö** (500 km)
- **Lund** (district heating currently covers 90% of heat demand)
- **Gothenburg** (1230 km currently supplying 80% of homes)
- **Espoo** (900 km)
- **Vantaa** (over 600 km supplying 70% of buildings and 90% of inhabitants)

Some are still expanding to optimise their networks. For example, **Turku** plans to grow its grid by 5 km — from 620 km (already reaching 90% of households) to 625 km.

Developing new district heating networks

In Belgian cities, where district heating is virtually non-existent, some municipalities are planning entirely new grids.

Mechelen, for instance, aims to move from no district heating to covering **40–50% of heat demand** by 2050. To make this possible, the city ran pilot projects alongside planning to prove feasibility and identify three high-potential areas: the **historic city centre** (dense residential neighbourhoods), **industrial zones** (large heat demand and residual heat potential), and **urban regeneration areas** undergoing transformation. The municipality also acted as a **broker** — it cannot mandate a heat network but can bridge the gap between developers and producers through dialogue and facilitation.

- **Leuven** is following a similar path, running pilot projects to design new grids and establish a legal structure for a heating company to manage them.

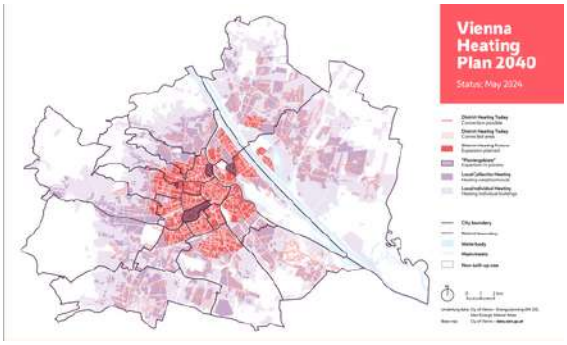
Even smaller communities are acting. **Bjaeverskov** (Denmark), a town outside Copenhagen disconnected from Denmark's larger networks, plans a **21 km citizen-owned grid** to provide its 300 residents with clean, affordable heat, building strong local support from the start.

Expanding district heating

German cities in the campaign are pursuing ambitious district heating expansion to drive decarbonisation:

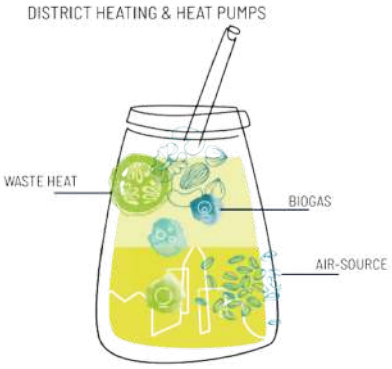
- **Mannheim** will add 100 km by 2030, expanding from 530 km to 630 km and increasing coverage from 60% to 75% of households.
- **Munich** plans to grow its network by more than 50%, from 1,000 km to 1,600 km by 2045.
- **Heidelberg** aims to move from 70% household coverage today to nearly 100% by 2040.

Vienna also plans major growth — from 1,300 km (currently serving 460,000 households) to 1,720 km — ensuring all densely built-up areas are covered.



Bjaeverskov, Denmark





Eastern European cities are similarly expanding existing systems:

- **Warsaw** will add 40 km to its 1,906 km network by 2027.
- **Tallinn** (currently 520 km) plans 10 km of expansion.
- **Celje** (Slovenia) will add 2.2 km to its 25.8 km system.
- **Kaposvár** (Hungary) plans an additional 4 km beyond its current 26 km.

Southern European cities, though less reliant on district heating, are also embracing growth:

- **Valladolid** (Spain) is expanding its network to 200 km, aiming to serve 65,000 homes.
- **Marseille** will grow from just 4.4 km to 21.7 km — nearly fivefold.
- **Lyon Métropole** will add 42.5 km to its existing 293 km.

Even **small towns and cities** are scaling up:

- **Salaspils** (Latvia) will add 1.4 km to its 20.6 km network.
- **Silkeborg** (Denmark) plans a major 221 km expansion beyond its existing 610.9 km.

Modernising district heating networks

Many Eastern European cities have extensive but **outdated and inefficient** district heating networks — often privately owned — making decarbonisation harder than in the North.

Slovenian cities such as **Celje**, **Maribor**, and **Velenje** are tackling this challenge through large-scale renovation programs to improve energy efficiency and enable renewable integration, moving away from coal and natural gas.

- **Velenje**, for instance, is upgrading its distribution network, substations, and end-user connections to reduce its current thermal losses of around 26%.

Hungarian cities are also investing in refurbishment, including **Miskolc**, **Kaposvár**, and **Szeged**.

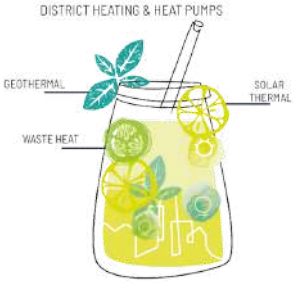
- The city of **Kapósvar** is modernising its system with efficiency upgrades and smart controls while shifting to biomass. Its success relied on a **tripartite financing model**, where the municipality, district heating company, and citizens co-funded the renovations.



Kapósvar , Hungary

Celje, Slovenia





Modernisation of district heating in Eastern Europe is crucial to not only increase efficiency and reduce thermal loss, but also to **restore residents' trust** in collective heating networks. Restoring trust is crucial to avoid that citizens disconnect from the network in favour of individual gas boilers. Renovations must be paired with constant communication efforts and awareness-raising campaigns, such as was done in **Kapósvar**, to convince citizens to stay connected or reconnect to district heating.

The **Baltic cities** have shown exemplary progress as well.

- **Tallinn and Vilnius** have modernised while expanding: Vilnius, for example, replaced aging pipes in its 760 km system, reducing heat loss from 24% to just 12%.



Tallinn, Estonia

Step 3. Renewable Heat Sources

Among the campaign cities, ten already have district heating systems with more than 60% renewable energy:

- **Reykjavik** (100%)
- **Växjö** (99%)
- **Salaspils** (95%)
- **Vaasa** (90%)
- **Turku** (89%)
- **Besançon** (80%)
- **Vilnius** (70–80%)
- **Dijon Métropole** (75%)
- **Tallinn** (70%)
- **Lappeenranta** (65%)

Many of these rely heavily on **biomass**, **biogas**, or **waste incineration** as primary renewable heat sources. Only **Reykjavik** achieves 100% renewables largely due to its exceptional **geothermal potential**.

Geothermal

Geothermal energy is a **key decarbonisation driver** — cited as a detox ingredient by **22 of the 55 campaign cities**.

- **Reykjavik** is the undisputed geothermal leader due to its particular geological conditions. Its entire heating system is geothermal, developed after the 1970s energy crisis. Today, Reykjavik Energy is advancing further by adding **carbon capture, injection, and mineral storage** at its main geothermal power plant to cut emissions by 95% and capture up to 34,000 tonnes of CO_2 annually.



Other cities seeking to maximise local geothermal resources include **Munich** (Germany), and the Hungarian cities **Miskolc** and **Szeged**.

Southern European cities are also tapping into geothermal potential:

- **Alexandroupolis** (largest geothermal potential in Greece, Antheia-Asistino basin).
- **Angoulême** (Aquitaine basin, France)
- **Radicondoli** (five geothermal plants, Italy).



Reykjavik, Iceland

Munich, Germany

Geothermal is under active exploration in German, Belgian, Dutch and Austrian cities, projected to be an essential detox ingredient for **Leuven**, **Mechelen**, **Munich**, **Mannheim**, **the Hague** and **Vienna**.

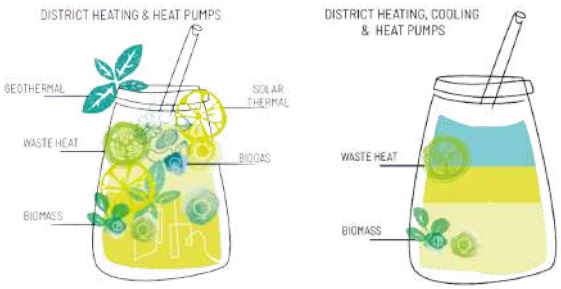
- **Munich** plans to supply three-quarters of its heat from deep geothermal plants.

Hungarian cities have vast untapped potential:

- **Szeged** converted its 250 km network from gas to **50% geothermal** — Europe's largest geothermal district heating renovation.
- **Miskolc** already supplies 50% geothermal heat and aims for 95%.
- **Budapest** also sees geothermal as its main decarbonisation pathway.

Geothermal is also cited as a **cooling source** in **Limassol** and **Angoulême**.

(Note: other cities may also use geothermal but were not mentioned in the case studies.)



Warsaw, Poland Turku, Finland

Waste heat

Waste heat is one of the most widely used renewable source, cited as a detox ingredient by 25 of the 55 campaign cities.

Heat from Wastewater Treatment

Many cities are capturing heat from **wastewater treatment plants**, which featured as one of the most recurring projects across campaign cities, including **Budapest, Espoo, Heidelberg, Lyon Métropole, Maribor, Mechelen, Prague, Tallinn, Turku, Vienna, Vilnius** and **Warsaw.**

- In **Prague**, recovering heat from the central wastewater plant (serving 93% of the city's wastewater) could replace **30% of coal-based heat**.
- In **Budapest**, recovered wastewater heat (along with geothermal) is projected to cover one third of heat demand by 2030.
- In **Turku**, this type of waste heat may contribute only to 8% of the city's heating needs but it covers 85% of cooling needs.

Large-scale heat pumps make these projects to recover sewage water possible:

- **Warsaw** has 2–3 sewage heat pump installations;
- **Turku**'s Kakola facility extracts low-temperature heat from wastewater to feed into the DH network;
- **Espoo** runs Finland's largest heat pump unit, meeting around 20% of local district heating demand.

Heat from Data Centres

Data centre heat recovery is emerging as a key source in many cities.

8 campaign cities highlighted they were leveraging heat from data centres, including **Stockholm**, **Dublin**, **Espoo**, **Salaspils**, **Marseille**, **Vienna**, **Prague** and **Warsaw** – many already recovering or planning to recover waste heat coming from newly data hubs established in their areas. Such projects emerge from strong public-private partnerships and opportunities become reality only with efficient coordination between the municipality, district heating operators and data companie

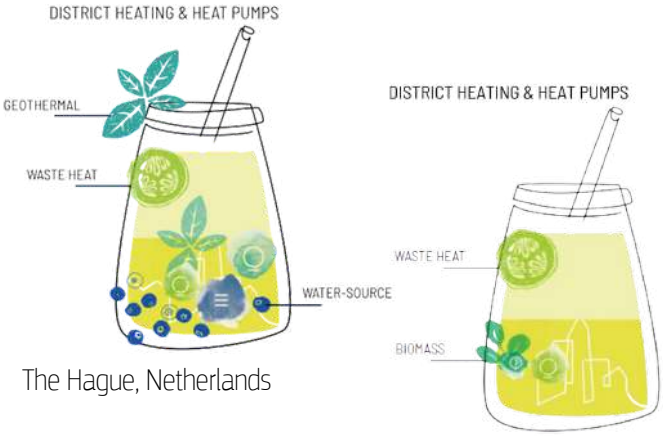
- In **Dublin**, Amazon's new data centre enabled **Ireland's first large-scale district heating network** (Tallaght District), operational since 2023.
- In **Espoo**, Finland, a major partnership with Microsoft will integrate waste heat from three data centres into Espoo's district heating network, cutting 40% of demand and saving 400 000 tonnes of CO2 annually.
- Other data hubs such as **Marseille** have their eye on this type of project and partnerships to advance their decarbonisation strategies.

The transposition of the EED on **waste heat recovery from data centres** should further boost this type of clean heat solution.

Industrial Heat

Other types of waste heat come from:

- **Industrial processes** such as in **Lyon** and **Vilnius**. In the latter, the most powerful absorption heat pump in the Baltic region is being set up to recuperate waste heat from production processes.
- **Port operations** like in **the Hague** (from nearby port of Rotterdam) and **Gothenburg**.
- **University research facilities**, such as in **Lund**, Sweden.



The Hague, Netherlands

Vilnius, Lithuania

Heat from Metro Lines

In **Warsaw** and **Prague**, projects to recover heat from **newly built metro lines** are in motion.

These **Eastern European cities** are leveraging their robust metro infrastructure and intentionally designing new lines to capture residual heat from new developments, channeling it into district heating networks to warm nearby municipal buildings. Such innovative projects are vital for helping these capitals break away from their dependence on coal.

Accelerating decarbonisation will also depend on the transposition of EU legislation on waste heat recovery, which will require Prague's district heating companies to integrate waste heat into their energy mix — something they have not done effectively so far due to the absence of a national obligation.

(Note: other cities may also be recovering waste heat but were not highlighted in the case studies.)

Solar Energy

Solar thermal is **less common but highly impactful**, mentioned by **9 cities**: **Geneva**, **Heidelberg**, **Kozani**, **Lyon Métropole**, **Salaspils**, **Silkeborg**, **Tallinn**, **Vienna** and **Vinnytsua**.

Of these, **3 campaign cities** have already established solar thermal plants and demonstrated its potential:

- **Silkeborg**, Denmark, hosts the world's largest solar thermal plant, covering 156,000 m^2 and meeting 20% of district heating demand, enabling summer operation solely on solar heat.
- **Geneva**'s solar thermal plant, operational since 2021, the plant provides >80°C water year-round for the district heating network, even during snow-covered days, and has saved 385 tonnes of CO_2 between 2021–2023.



Geneva, Switzerland

- The small town of **Salaspils** (Latvia) has rapidly decarbonised using solar: since 2018, its 20.6 km network has reached **20% solar thermal** (planned to expand beyond 25 km). EU funding supported Latvia's first large-scale solar district heating plant, cutting heat-related emissions by **88% since 2018**.

Large-scale heat pumps

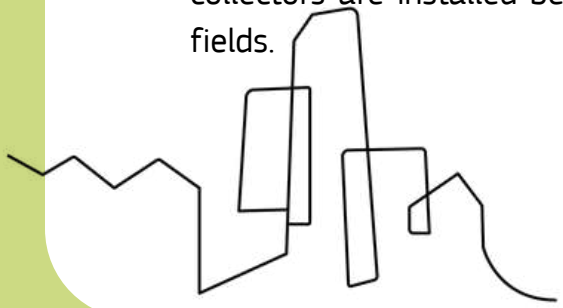
Alongside investments in their district heating infrastructure, many cities are building **large-scale heat pump facilities** to extract renewable heat mainly from **water sources** and pumping them into their district heating networks. Such heat pump facilities are built to pump sewage water, as outlined above. Some of these serve for both sewage water and nearby bodies of water such as rivers and the sea.

- **Espoo's** Suemoja facility recovers heat from wastewater and seawater.
- **Heidelberg** and **Tallinn** plan heat pumps using both sewage and river/sea water.
- **Heidelberg**, **Mannheim**, **Maribor** (Drava River), **Gothenburg**, and **Leuven** plan to set up heat pumps generating heat from their nearby rivers.
- **Tallinn**, **Marseille** and the **Hague** as coastal cities plan to leverage sea water for heat.
- **Vienna** will deploy large-scale heat pumps extracting heat from groundwater and air.

Heat Storage, Electrification & Artificial Intelligence

Besides district heating and large-scale heat pumps, **heat storage** is emerging as the next critical infrastructure for flexibility and renewable integration. It was cited in **10 cities**' strategies, with Finnish cities leading the way:

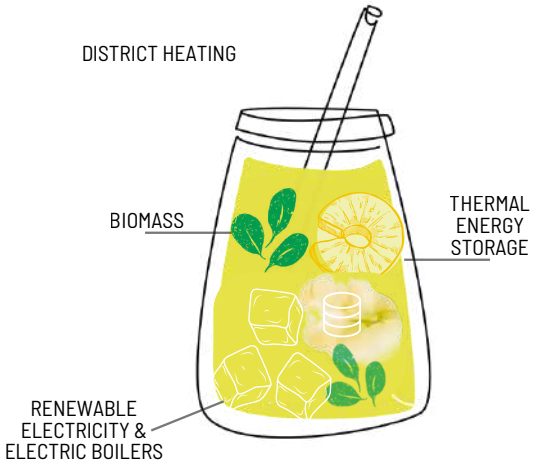
- **Vantaa**, **Lappeenranta**, **Espoo**, and **Turku** are pioneering heat storage facilities to optimise their decarbonisation strategies and better balance renewable energy in their district heating networks.
- Heat storage facilities are also planned in **Heidelberg** and **Vienna** as important parts of their decarbonisation pathway.
- **Celje** in Hungary is also planning on building out thermal storage tanks.
- **Warsaw** already counts on a hot water storage facility that can store 90 m3 of hot water for 24 to 26 hours.
- In **Vantaa**, a heat storage facility heats underground water with excess heat over the summer.
- In **Vasaa**, the city is repurposing 1970s era oil storage caverns beneath a powerplant to store heat. This storage system is planned to be extended, helping incorporate wind and solar energy into its electric heating mix. In the Hague, heat collectors are installed beneath sports fields.



Electrification of heat is also becoming an increasingly viable option for cities' decarbonisation. Electric boilers are mentioned as detox methods by **4 campaign cities**: **Bjaeverskov, Espoo, Turku,** and **Lappeenranta**. When paired with **heat storage** and **AI-driven demand response** to create a flexible and low-carbon system, the electrification pathway is promising.

- **Espoo** is using electric boilers and heat accumulators combined with artificial intelligence to optimise system operations, balancing district heating supply and demand in real time.
- **Lappeenranta** is actively transitioning away from biomass by electrifying heating and integrating **thermal energy storage, electric boilers,** and **AI-based demand response**. One of its flagship projects uses low-cost, low-emission electricity to charge thermal storage tanks at times when renewable electricity is abundant and cheapest. This system supplied **600 MWh of heat during winter 2023–2024**, covering **32% of local heat demand** and cutting **CO_2 emissions by 160 tonnes**.

Lappeenranta, Finland



The use of Artificial Intelligence is becoming a powerful enabler of efficiency and flexibility, mentioned **in 3 campaign cities'** strategies:

- Finnish cities like **Lappeenranta** and **Espoo** use AI to optimise district heating operations, shifting loads and charging thermal storage when renewable electricity is abundant and cheap.
- **Kapósvar** in Hungary is applying AI-driven **real-time load planning** to improve energy efficiency and network performance.

Carbon capture also comes up in **2 campaign cities'** strategies: **Reykjavik** and **Vantaa**.

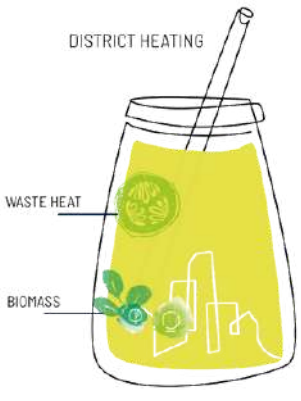
- **Reykjavik** — already 100% renewable through geothermal — is building the world's first **net-zero carbon geothermal facility**, combining carbon capture, injection, and mineral storage to cut emissions by **95%** and capture up to **34,000 tonnes of CO_2 annually**.

Biogas and Biomass: still more than a supplement

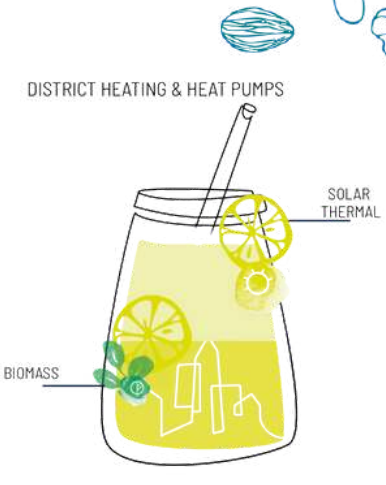
Biomass still remains a key decarbonisation source, cited as a detox ingredient for **27 of the 55 campaign cities** – more than half the campaign cities. This also makes biomass the most recurring detox ingredient across the case studies (more than geothermal and waste heat).

Some of these cities still rely on biomass and biogas as a major renewable heat source for their decarbonisation pathways. **7 cities** have already reached a high level of renewable heat in their mix thanks to biomass or/and waste incineration as the main sources of heat: **Vasaa** (90%), **Turku** (89%), **Besançon** (80%), **Vilnius** (70 to 80%), **Dijon Metropole** (75%), **Tallinn** (70%), and **Lappeenranta** (65%).

- Biomass the main source of heat for **11 cities**: **Besançon**, **Brest Métropole**, **Dijon Métropole**, **Kapósvar** (60% biomass), **Lappeenranta**, **Lund**, **Pécs**, **Turku**, **Valladolid**, **Vantaa** (biofuel), and **Växjö**.
- Some cities have biomass-fired cogeneration plants, including **Heidelberg** (wood-fired combined heat and power plant) and **Lund** (combined biomass-fired heat and power plant).
- Other cities have cogeneration plants still running on gas with partial biomass, but whose efficiency has reduced emissions considerably, including **Kapósvar** (35% of heating comes from gas-based co-generation, the other 60% comes from biomass) **Kozani**, and **Vinnystsua**.



Besançon, France



Kozani, Greece

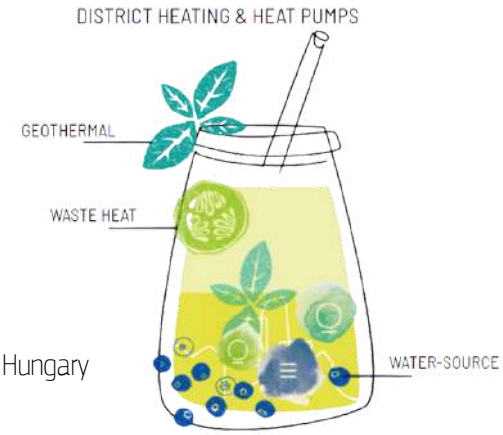
For some cities, biomass serves as a **supplement** and represents only a **small percentage** of their planned renewable mix, like **Munich** (3%) and **Vienna** (minimal use for multistorey residential buildings when heat pumps are not available).

Some cities – that have already implemented a shift from fossil fuels to biomass – now aim to **phase down biomass** in favor of more sustainable sources:

- Finnish cities such as **Espoo**, **Lappeenranta** and **Vasaa**, that are currently working on decreasing biomass from their mix, turning towards electrification and heat storage.
- **Lyon Métropole** is also trying to move away from biomass towards more renewable sources of heat, such as geothermal, waste heat and solar thermal.
- **Salaspils** is also looking to swap out biomass for more solar thermal.

Waste incineration also appears in multiple cities' strategies:

- **Pécs**, Hungary, using solid recovered fuel produced from non-hazardous commercial and household waste.
- **Vantaa**, Finland, with a waste-to-heat facility processing 600 000 tonnes of mixed waste annually.
- **Budapest** for which waste incineration currently represents 10% of their heating.
- **Celje**, Hungary, for which waste incineration currently supplies 70% of energy needs.
- **Mannheim** using organic waste incineration.
- **Vienna**, as one of the many ingredients of their detox.



Budapest, Hungary

Parallel Steps

Building Renovation & Energy Efficiency Upgrades

Energy efficiency and building renovation play a predominant role in many of the cities' heat strategies, especially in **Kapósvar** and **Velenje** where most of the efforts are concentrated.

- In **Kapósvar**, a tripartite financing model – involving municipality, DH company, and citizens – funded building-level refurbishments, with 100% participation. This collaboration achieved 78% CO2 cuts since 2016 and reduced DH prices by 58% in 2024. The city applied smart pumps and multilevel control at building level, while installing thermostat control in each building.

Other cities mention efforts to advancing energy efficiency of buildings through insulation, like **the Hague**, **Heidelberg** and **Vinnytsua**.

Campaign cities that **do not have district heating infrastructure** are also focusing on heat pumps and increased energy efficiency and thermal comfort in buildings, making their **building stock heat pump–ready and well insulated.**

- Portuguese cities like **Porto** and **Guimaraes**. In **Guimaraes,** they are piloting this through their Bairro C pilot zone where all public buildings must be net-zero.
- Small Greek towns, including **Domokos** and **Vari-Voula-Vouliagmeni,** are also focused on heat pump installation and municipal building refurbishment.
- **Ghent** established a **one-stop shop for home renovations**, assisting residents in moving away from fossil fuel heating. The initiative focuses on affordability and social housing, while supporting citizens in preparing homes for **heat pumps.**



Guimarães, Portugal

Stakeholder Engagement

Strong collaboration with district heating and energy companies was highlighted as essential by many campaign cities:

- **Valladolid** benefits from close cooperation with regional public operator Somacyl.
- **Espoo** has a long-standing partnership with Finnish energy company Fortum.

Conversely, **Prague** and **Budapest** show how a **lack of alignment and municipal influence over DH companies** can hinder progress.

Collaboration with local industry is equally important, especially in projects of waste heat recovery:

- **Dublin**'s success stems from the partnership between the city council, Amazon, Fortum (contractor), and energy agency **Codema**, creating an innovative low-carbon heat-pump solution using residual heat.
- **Espoo** enabled a major **Microsoft–Caruna** partnership, integrating data centre waste heat into the DH network, significantly cutting CO_2 emissions.
- **Stockholm**'s **Open District Heating** initiative — a collaboration between the city, **Stockholm Exergi**, and local data centres — simplifies connection for excess heat producers. It also includes other industries, such as supermarkets and yeast plants. The city supports Open DH by **providing land, networking support, and reducing bureaucratic barriers**.

Partnerships with **research institutions** help cities innovate:

- **Lappeenranta-Lahti University of Technology** provides technical solutions to accelerate **Lappeenranta's** heat transition.

Broad-based coalitions and partnerships, from businesses to civil society and universities, are seen as key enablers for these strong partnerships:

- **Mechelen** created a **Heat Coalition** of **25+ partners** — from private sector to social organisations and research institutes — to co-design and implement its Heat Plan.

In **The Hague**, heat transition planning is done **district by district**, with input from residents and businesses. The **Hague Climate Agreement** also brings stakeholders together under an **independent Climate Council** to advise and monitor progress.

Governance Models & Ownership

Municipal ownership or strong influence over **energy companies** is a key enabler:

- **Lund** owns its biomass plant, and **Tallinn** partially owns DH provider **Utilitas**, aligning company goals with city climate targets.
- **Vantaa** fully owns **Vantaa Energy** and includes political representatives on its board, ensuring climate-aligned decisions.
- **Växjö**'s municipally owned local energy company accelerates the fossil fuel phase-out.
- **Dublin** created **Heat Works**, Ireland's first **non-profit public energy utility**, owned by **South Dublin County Council**, acting as pioneer in Ireland, supporting local and national action plans to reduce emissions.

Local, regional and national climate and energy agencies play a major role:

- **Budapest** established a new Climate Agency that is driving its heat strategy.
- **Dublin** benefits from its Energy and Climate Agency Codema that manages all partnerships and projects.
- In **France**, the national agency **ADEME** funds cities' heat transitions and protects vulnerable populations via the **Fonds Chaleur (Heat Fund)**, cited as a key lever by all French cities in the campaign.

Multilevel governance is also a key enabler:

- **Velenje**'s heat decarbonisation pathway is embedded in the Regional Development Plan of the Saleska Valley and aligned with Slovenia's national energy renovation strategy. Both frameworks emphasise improving the energy efficiency of district heating systems, supporting municipalities in developing large-scale building renovation programmes, and accelerating the integration of renewable energy into district heating networks.



Ownership of building stock and control over public housing also gives municipalities more leverage over their heat transition:

- **Vienna** owns a large portion of the building stock with 220 000 municipality-owned apartments (95 000 of which still rely on gas) and can more easily define district heating connections.
- **Espoo** owns the public housing company that has 17 000 homes connected to the district heating network.

Citizen Engagement

Successful engagement of citizens was highlighted as a key success factor:

- **Kapósvar** engaged residents extensively through **regular communications** with condominium associations, building trust and awareness. Citizen-to-citizen communication, driven by **lower heating costs**, was a major success factor.
- **Bjaeverskov** also encouraged residents to invest and participate by joining a thermal energy community, letting them **benefit directly** from the heat transition.

Other cities highlight the importance of **transparency and guidance towards citizens**:

- **Munich** offers **proactive counselling** for households and an **interactive heat map** where residents can check district heating availability and alternatives for their neighbourhood.
- **Vienna**'s heating plan guides property owners and tenants on switching away from gas. Its "**100 Projects Out of Gas**" actively engages communities to explore clean heating options available to them.

Citizen engagement is also central to the strategies of **Domokos** and **Vari-Voula-Vouliagmeni**, which carried out engagement initiatives and consultations in the schools where they were implementing projects.

Index – Case Study Summaries

City	Country	Summary
Alexandroupolis	Greece	Greece is advancing geothermal energy through a new project in the Antheia-Aristino low-enthalpy geothermal field near Alexandroupolis. The field contains geothermal fluid above 90 °C, making it suitable for district heating. The €6.2 million investment—95% co-financed by the ERDF—will establish a geothermal heating network to supply municipal buildings, social housing, and greenhouses with an estimated thermal output of 10 MW. This initiative is the first step toward expanding geothermal heating to residential and industrial users. Part of the IRIS Smart Cities programme, the project strengthens local resilience and supports Greece's low-carbon transition while addressing licensing and regulatory challenges for future replication.
Angoulême	France	The Alpha media library in Angoulême showcases exemplary heat decarbonisation using geothermal energy. Located in the Aquitaine Basin—France's second-largest geothermal resource area—the building meets 96% of its heating and cooling needs through 21 vertical ground probes up to 99 meters deep. A heat pump provides winter heating, while passive geocooling ensures summer comfort, avoiding waste heat and reducing energy use. Combined with natural ventilation and adaptive architecture, Alpha maintains year-round efficiency with just 5.5 kg CO_2/m^2 emissions. This project proves how mid-sized cities can leverage deep geothermal potential for clean, resilient, and cost-effective thermal performance.
Bergamo	Italy	Bergamo is expanding its district heating network through a partnership between A2A Calore & Servizi and the REA DALMINE waste-to-energy plant. By recovering unused heat from the Dalmine facility, upgrading pumping stations, and adding thermal storage, the city will increase available district heating by 50%. This expansion will connect neighborhoods including Colognola, Malpensata, San Tomaso, the stadium, and Via Corridoni, serving buildings with centralized heating systems. The project will cut 14,500 tons of CO_2 emissions annually, providing low-carbon, reliable heat while leveraging local waste heat, improving efficiency, and supporting Bergamo's transition toward sustainable urban energy.
Besançon	France	Besançon is expanding its reliable, cost-controlled district heating network—already 80% renewable and 30% below market rates—through a 74 km westward extension. This ambitious project, challenging for a mid-sized city, will cut 35,000 tons of CO_2 annually and cover 18% of metropolitan heat demand. The network uses waste heat from biomass incineration and other local sources, achieving nearly 100% efficiency and emitting just 37g CO_2/kWh. Strong stakeholder coordination and public trust, built through transparent pricing and near-perfect uptime, make the system a model of resilience. The expansion also prioritises energy-poor communities, ensuring equitable access to clean, affordable heat.

Bilbao	Spain	Bilbao, Spain, aims for climate neutrality by 2050 and a 55% reduction in greenhouse gas emissions by 2030 under its Sustainable Energy and Climate Action Plan. Buildings account for 33% of the city's emissions, making heating and cooling a central priority. Through the Decarb City Pipes 2050 project, Bilbao has developed a Heating and Cooling Plan to phase out fossil fuels, expand low-temperature district heating and cooling networks, and promote electrification via heat pumps, geothermal, hydrothermal, and waste heat. Supported by mapping and a Transition Roadmap, the plan is backed by public-private partnerships and the new BioArtigas energy agency.
Bjaeverskov	Denmark	Bjæverskov, a Danish town of 3,000 residents, is proving that small communities can lead the district heating revolution. By 2027, most buildings will switch from individual gas boilers to a fossil-free network powered by surplus heat from a nearby electric transformer station, air-to-water heat pumps, and an electric boiler—delivering 98% renewable heat. The project is citizen-owned, ensuring affordability and strong local support, with 90% of households committed to connect. This stand-alone solution demonstrates how waste heat and renewable integration, combined with community engagement, can decarbonise heating for small towns, offering a replicable model for European towns of similar scale.
Brest Metopole	France	In Brest, where heating accounts for 30% of CO_2 emissions, the city is advancing a diversified heat decarbonisation strategy. Its "detox mix" includes biomass, waste incineration, and solar energy, aiming to reduce fossil fuel reliance and improve urban livability. Brest plans to expand its existing 55 km district heating network and develop new systems powered by low-carbon sources. Tackling energy poverty is a key goal, alongside broad stakeholder engagement and strong political backing. With support from national and European agencies, Brest is building a resilient, integrated approach to sustainable heating in a cold, maritime climate.
Budapest	Hungary	Budapest, Hungary, aims to reach climate neutrality by 2030 and is focusing on decarbonising its heating system, which accounts for over 60% of emissions. The strategy relies on expanding geothermal energy and heat pumps using sewage heat, with a target for these sources to supply one-third of district heating by 2035. District heating plays a key role, but challenges include securing funding, upgrading infrastructure, and overcoming regulatory and financial barriers. High private homeownership and the need to regain public trust in the system add complexity. Budapest is developing financing schemes, pilot projects, and institutional collaboration to enable the transition.
Campi Salentina	Italy	The G.R.O.W.S. project in Campi Salentina demonstrates that small municipalities can achieve significant heat decarbonisation. Funded partly by the European Investment Bank, the project upgrades public and social housing with high-efficiency heat pumps, improved insulation, low-emissivity windows, and photovoltaic panels. These measures target energy savings of 15.07 GWh/year and renewable energy production of 1.134 GWh/year, reducing CO_2 emissions by 4,913 tons annually. G.R.O.W.S. fosters public-private partnerships, supports energy communities across North Salento, and prioritizes energy equity for vulnerable households. The initiative also stimulates local jobs, promotes circular economy practices, and provides healthier, low-carbon thermal comfort for the population.

Celje	Slovenia	Celje, Slovenia's fourth-largest city, is modernising its district heating system to cut emissions, improve energy security, and boost the local economy. Currently powered mainly by a waste incineration plant (70% of supply), the system will integrate renewable energy sources such as heat pumps, solar thermal fields, and geothermal energy. A new sustainable heating and cooling plan, set for completion by 2025, will guide this transition and support energy efficiency through network expansion and heat storage. By replacing fossil fuels with local renewables, Celje aims to reduce CO_2 emissions, provide cleaner air, and enhance resilience against energy price volatility.
Dijon Metropole	France	Dijon is leveraging its extensive district heating network—already serving over two-thirds of buildings—to decarbonise its heating sector by 2030. Currently, 75% of the network's energy comes from renewable sources like waste heat and biomass. The city aims to reach 82% by 2026 by adding green gas and building a new biomass unit. With plans to expand network coverage to 80% of buildings, Dijon balances ambition with caution, ensuring investments don't raise consumer energy bills. This pragmatic approach positions Dijon as a leader in heat decarbonisation through efficient infrastructure and a steadily greener energy mix.
Domokos	Greece	Domokos, in central Greece, is enhancing energy efficiency and decarbonisation in its public buildings, focusing on schools and daycare centres. The municipality is installing air-to-water and reversible heat pumps alongside rooftop photovoltaic systems to reduce fossil fuel use and generate clean electricity. These measures improve indoor comfort, lower operational costs, and support climate neutrality. The project actively engages local stakeholders—including citizens, school staff, private contractors, and research organisations—to ensure technical feasibility and broad support. By upgrading educational facilities with renewable and efficient heating and cooling systems, Domokos is setting a scalable example for sustainable public infrastructure.
Dublin	Ireland	The Tallaght District Heating Scheme (TDHS) in Dublin, Ireland, is the country's first large-scale district heating network, operational since early 2023. It delivers low-carbon heat to local buildings using waste heat from the nearby Amazon data centre, supplemented by heat-pump technology, saving nearly 1,500 tonnes of CO_2 annually. Operated by Heat Works, a not-for-profit owned by South Dublin County Council, the scheme exemplifies innovation in emerging district energy markets. By efficiently using recyclable heat and fostering public-private collaboration, TDHS provides sustainable, reliable heating while supporting local climate goals, economic growth, and social benefits for residents and businesses.
Espoo	Finland	Espoo, Finland, targets carbon neutrality by 2030, with district heating—a major emissions source—central to its plan. Through the Espoo Clean Heat programme, the city collaborates with Fortum to replace coal (phased out in 2024) with sustainable solutions, including waste heat recovery from data centres, wastewater, and smaller sources. A major partnership with Microsoft will integrate waste heat from three data centres into Espoo's district heating network, covering 40% of demand and cutting 400,000 tonnes of CO_2 annually. This effort relies on Finland's supportive policy framework, a robust district heating system, and multi-stakeholder collaboration across municipalities, utilities, and technology firms.

Geneva	Switzerland	Geneva's solar thermal plant demonstrates the city's commitment to heat decarbonisation. Operational since 2021, the plant provides >80°C water year-round for the district heating network, even during snow-covered days, and has saved 385 tonnes of CO_2 between 2021–2023. Its consistent performance debunks myths about solar heating reliability in cold climates, operating with minimal maintenance. By integrating solar thermal energy into the district heating system, Geneva reduces reliance on fossil fuels, delivers healthier, low-carbon heat to residents, and reinforces the potential for renewable thermal energy to meet urban heating demands efficiently and sustainably.
Ghent	Belgium	Ghent has adopted a fossil-free heating strategy emphasizing individual heat pumps and low-temperature district heating for new developments and large apartment buildings. To enable a smooth transition, the city supports home renovations and ensures residences are heat pump ready, prioritizing affordability and social housing. Industrial residual heat will mainly serve businesses rather than homes. Ghent's approach combines technical upgrades, inclusive planning, and policy support to protect vulnerable populations. Key challenges include legislation, grid capacity, renovation costs, and skilled personnel. The city continues to expand small-scale networks, retrofit social housing, and build administrative capacity for neighbourhood-level climate action.
Gothenburg	Sweden	Gothenburg is one of Europe's most advanced district heating cities, with 80% of homes and nearly all large buildings connected to its extensive 1,230 km network. District heating is central to the city's climate neutrality goal by 2030, providing an efficient alternative to individual electric heating. The system already integrates waste heat (75%) and renewables, and by 2025 a new biomass CHP plant will bring fossil fuels close to zero. District cooling is also expanding, doubling its capacity in the next decade. This integrated heating and cooling strategy shows how dense urban areas can decarbonise while ensuring reliable, affordable energy.
Guimarães	Portugal	Guimarães aims to fully decarbonise its heating and cooling systems by 2030, focusing on electrified heat pumps and renewable energy communities powered by hydro, biomass, and solar. The city is upgrading public buildings for higher energy efficiency and thermal comfort, with the UNESCO-listed "Bairro C" as a pilot zone. New public buildings must be net-zero, and citizen engagement is central to the plan. Challenges include financing, public awareness, and access to technology, but Guimarães continues to lead by example in its heat detox journey, aligning with its bid to become Europe's Green Capital.
Heidelberg	Germany	Heidelberg, Germany, aims for climate-neutral heating by 2030 through a large-scale expansion of its district heating network and a complete phase-out of coal, oil, and gas. Currently, half of the city's buildings are connected to district heating, and the new municipal heat plan calls for significant network growth to reach more buildings. The plan also includes integrating renewables such as solar thermal energy, biomass, and heat pumps using river and cleaned sewage water. For remaining buildings, decentralised solutions like electric heat pumps will be encouraged. Key challenges include high investment needs, limited time, lack of staff and technical complexity.

Kapsovár	Hungary	Kaposvár, Hungary, is transforming its district heating (DH) to meet EU decarbonisation targets and boost energy security through local renewable sources. Despite rising DH prices and disconnections from outdated networks, the city modernised and expanded its system with efficiency upgrades, a shift from gas to biomass, and smart controls. Two 7.5 MW biomass boilers now supply 60% of heat, supported by local forestry waste, while biogas from the sugar industry complements supply. A tripartite financing model—municipality, DH company, and citizens—funded building-level refurbishments, with 100% participation. This collaboration achieved 78% CO_2 cuts since 2016 and reduced DH prices by 58% in 2024.
Kozani	Greece	Kozani, in Western Macedonia, is transitioning its district heating system away from lignite as Greece phases out coal by 2027. District heating covers 99% of local heating demand and is now facing supply and cost challenges. The city's plan includes a phased approach: short-term reliance on natural gas with electric boilers and CHP, followed by integrating solar thermal, heat pumps, and green electricity to achieve climate neutrality. Investments exceed €120 million, supported by EU and national funds. Key next steps include finalising the renewable mix, securing financing, and implementing Phase III for full renewable integration by 2030.
Lappeenranta	Finland	Lappeenranta, Finland, is advancing carbon neutrality by 2030 through efficient thermal energy storage integrated into its district heating network. The system uses low-cost renewable electricity to charge thermal storage, optimising charging hours with AI-based algorithms to reduce fossil fuel use and emissions. In winter 2023–2024, it supplied 600 MWh of heat, covering 32% of local demand and reducing CO_2 emissions by 160 tonnes. The initiative is a collaboration between the City of Lappeenranta, Lappeenrannan Energia, LUT University, and Elstor Oy. Future plans include expanding storage, deploying electric boilers, and piloting demand response to enhance flexibility and affordability in heating.
Leuven	Belgium	Leuven aims for a full-city heat detox by 2030, with heating and cooling responsible for 60% of its emissions. As district heating is new to Belgian cities, the city is developing networks and exploring geothermal and aqua-thermal solutions from rivers and canals. Pilot projects under NetZeroCities strengthen governance, finance, and stakeholder collaboration to implement energy strategies while retrofitting buildings. Leuven focuses on inclusive planning, involving citizens, companies, and knowledge institutions. With growing network connections and energy-positive developments, the city is building expertise and infrastructure to accelerate decarbonisation, while addressing regulatory, financial, and engagement challenges.
Limassol	Cyprus	Limassol, Cyprus, has implemented a decentralized open-loop geothermal system at the Castle Residences, a 66-apartment complex inaugurated in 2021. The system provides heating, cooling, and domestic hot water through individual water-cooled heat pumps in each apartment, integrated with a central Building Management System (BMS) for optimal energy efficiency. With a total cooling capacity of 1,120 kW, the project maximizes energy performance while eliminating external air conditioning units. It combines geothermal technology with heat recovery mechanisms, demonstrating sustainable urban living and carbon reduction, and represents the largest energy integration initiative of its kind on the island.

Lund	Sweden	Lund, Sweden, with a population of 128,000, has committed to become climate-neutral and fossil fuel-free by 2030. District heating, operated by Kraftringen, now meets 90% of the city's heat demand. Key steps include the 2015 biomass-fired combined heat and power plant, phasing out natural gas, and the development of the world's largest low-temperature district heating network in Brunnshög, utilising waste heat from Max IV. Political stability, cross-sectoral coordination, and municipal investment facilitated the projects. Challenges included securing biomass feedstock and high upfront costs. Both projects have potential for replication in Sweden and other European cities.
Lyon Metropole	France	Lyon Metropole is rapidly expanding its district heating network to cut emissions and improve energy resilience. Heating makes up nearly half the city's energy demand, and the network—already at 66% renewable and recovered energy—aims for 80% by 2030. By 2026, 200,000 homes will be connected, shifting away from fossil fuels. The system incorporates geothermal, solar thermal, heat recovery from industry and wastewater, and heat pumps. Financial support from national schemes like ADEME keeps prices stable, helping tackle energy poverty. Lyon's approach combines infrastructure growth with innovative, low-emission technologies for a more sustainable urban heating system.
Mannheim	Germany	Mannheim, Germany, is committed to fully decarbonising its district heating system by 2030. Currently, 60% of households are connected, with 30% of heat supplied from existing renewables, primarily thermal waste treatment. With heating still contributing to 40% of the city's GHG emissions, the city's 2023 heat plan charts the path forward, with expansion of the network and integration of additional renewable sources, mainly geothermal energy and river heat pumps. Main challenges include engaging citizens in connecting to district heating and fully replacing fossil fuels with renewable sources by 2030.
Maribor	Slovenia	Maribor, Slovenia's second-largest city, is phasing out fossil fuels from district heating as part of its strategy to achieve carbon neutrality by 2040. The city has moved from coal to natural gas and is now transitioning to renewable energy, including biomass, geothermal, waste heat, and high-temperature heat pumps using the Drava River. District heating plays a central role, with plans to expand the network, integrate waste heat from thermal waste treatment, and explore hydrogen and syn-gas solutions. By 2030, Maribor aims for 60% renewable heat and significant emissions reductions, supported by EU climate targets and local partnerships.
Marseille	France	Marseille is decarbonising heating and cooling by harnessing sea thermal energy, using the Mediterranean Sea to power innovative thalassothermal networks like Massileo and Thassalia. These systems supply heating and cooling via seawater, cutting CO_2 emissions by up to 80%. The city is also exploring waste heat recovery from data centres. Expanding these networks, especially to public and social housing buildings, is a key next step. To scale up, Marseille is relying on multi-stakeholder cooperation and national funding (ADEME). Its approach offers a pioneering model for sustainable cooling in hot, coastal urban environments.

Mechelen	Belgium	Mechelen is embracing district heating and heat storage, a new approach for the city, as leading solutions outlined in its municipal heat plan to decarbonise 35,000 gas-connected buildings by 2050. To implement this ambitious plan, the city established the Heat Coalition, a multi-level partnership of government, businesses, and civil society, ensuring coordinated action, stakeholder engagement, and inclusive solutions. District heating networks will harness renewable and residual heat from sewage systems, data centres, and industrial processes, supported by thermal storage and urban renewal projects. The heat plan also addresses energy poverty by piloting energy communities in social housing, to ensure that the transition delivers both environmental and social benefits.
Miskolc	Hungary	Miskolc, Hungary, is advancing its heat detox to achieve climate neutrality by 2030. With heating responsible for nearly half of the city's emissions, decarbonising district heating is a key strategy. The city leverages its extensive network, currently serving one-third of buildings, and geothermal energy, which now provides 50% of the supply. Plans aim to increase geothermal share to 95% while refurbishing the network. Miskolc also addresses energy poverty by adopting an inclusive approach, involving citizens in planning, and promoting behavioural change.
Munich	Germany	Munich is part of the EU Mission to become climate-neutral by 2030 and is implementing a comprehensive heat transition plan. Heating and cooling account for around 40% of the city's emissions. The plan includes expanding the district heating network by about 60%, from 1,000 km to 1,600 km by 2045. District heating will be fully decarbonised by 2040, with around 75% supplied by deep geothermal energy, supported by large-scale heat pumps. Additional sources will include wastewater heat, waste incineration, and biomass, with green hydrogen expected to cover peak demand. Citizen engagement measures include advisory services and support for decentralised solutions.
Oulu	Finland	Oulu, Finland, is testing multiple building heating solutions under an EU Horizon 2020 project, including a novel heat pump using return water from district heating. The project aims to demonstrate energy-saving technologies and assess their performance over two years, considering integration within the district heating system. A key objective is to develop replicable, cost-effective solutions for wide-scale application. The initiative also includes drafting an Oulu Energy Plan for 2050, ensuring flexibility to incorporate emerging clean energy technologies. The project spans five years, involving local stakeholders such as Oulu University, Oulun Energia, and VTT, alongside international partners, promoting cross-sectoral collaboration.
Pécs	Hungary	Pécs, Hungary's fifth-largest city, targets an 80% CO_2 reduction by 2030 (from 2021 levels) and full carbon neutrality, aligning with EU climate objectives. District heating plays a key role: 95% of its system is now carbon neutral after the city's power plant shifted from coal to biomass and natural gas in phases completed in 2004 and 2013. The transition, driven by strict EU emission regulations, rising fossil fuel costs, and CO_2 taxes, uses wood chips, agricultural by-products, and solid recovered fuel (SRF). This change has cut over 450,000 tons of CO_2 annually, supporting compliance with EU decarbonisation pathways.

Porto	Portugal	Porto's "Asprela + Sustentável" project tackles heat decarbonisation by creating its first Renewable Energy Community in the Agra do Amial social housing complex. It includes 127 kWp of photovoltaic panels powering homes and a local school through a self-consumption model. On-site surveys identified energy poverty and thermal discomfort, guiding the project's design. Around 362 residents now benefit from improved access to clean electricity for heating and cooling. This initiative enhances energy efficiency, combats energy vulnerability, and supports Porto's goal of climate neutrality by 2030 through local, renewable heat solutions.
Prague	Czech Republic	Prague aims to reduce CO_2 emissions by 45% by 2030, but its district heating network still relies heavily on coal. The city plans a gradual transition by introducing large heat pumps at the Central Wastewater Treatment Plant, which could replace 30% of coal-based heat, and using geothermal energy from the new metro line under construction. Future projects will capture waste heat from data centres and river-based systems. Progress faces challenges: the DH system is owned by Veolia, which prioritises gas, and legislation does not yet recognise waste heat. Prague expects EU directives to support integrating renewable and waste heat sources.
Radicondoli	Italy	Radicondoli, Italy's second-largest geothermal energy producer - thanks to its five geothermal plants - is expanding its geothermal district heating network to become the region's first 100% carbon-free municipality. Using residual heat from nearby geothermal plants (90–120°C), the system efficiently replaces fossil heating for homes and public buildings. Energy costs have dropped to just €0.050/kWh. Uniquely, Radicondoli ensures geothermal benefits stay local by reinvesting Enel Green Power royalties into network expansion and community subsidies—covering electricity bills, housing, transport, and new businesses. This localised use of waste heat and funds makes Radicondoli a leading example of inclusive, low-cost, and sustainable heat decarbonisation in small municipalities.
Reykjavik	Iceland	Reykjavik, Iceland, has achieved 100% renewable-based heating through geothermal energy, replacing oil heating during the 1970s energy crisis. Today, all homes in the city use geothermal district heating, saving an estimated 3.5–4.0 million tonnes of CO_2 annually compared to fossil alternatives. To further reduce emissions, Reykjavik Energy is implementing the EU-funded Silverstone Project at the Hellisheidi power plant. This initiative combines carbon capture, injection, and mineral storage to cut plant emissions by 95%, equivalent to 34,000 tonnes of CO_2 annually. Full-scale deployment will also include Nesjavellir by 2030. These measures support Reykjavik's target of net-zero energy production by 2030, as part of the EU mission for climate-neutral and smart cities.
Salaspils	Latvia	Salaspils, Latvia, has reduced heat-related emissions by 88% since 2018 through its municipality-owned district heating network. Starting with 20.6 km in 2018, the network now integrates a 20% solar thermal share and plans to expand to over 25 km. EU funding supported the installation of one of Latvia's first large-scale solar district heating plants in 2019. The next phase focuses on installing heat pumps to recover waste heat from data centres, further reducing natural gas reliance. Salaspils Siltums reinvests 50% of profits into network upgrades, ensuring long-term sustainability and cost control. District heating remains central to achieving full decarbonisation.

Silkeborg	Denmark	Silkeborg, Denmark, hosts the world's largest solar thermal plant, covering 156,000 m^2 and meeting 20% of district heating demand, enabling summer operation solely on solar heat. Since 2014, the city has pursued a heat detox to achieve carbon-neutral heating by 2030. Today, the system combines solar thermal, waste heat recovery, and electric boilers, already covering 42% of demand. Upcoming additions include electric heat pumps and a biomass boiler using local wood waste, reinforcing affordability and local resource use. Silkeborg demonstrates how renewable district heating and circular solutions can decarbonise heat for smaller cities while maintaining cost stability and reliability.
Stockholm	Sweden	Stockholm is turning waste into warmth by integrating data centres' excess heat into its 3,000 km district heating network, a key step toward its climate positivity goal by 2040. The initiative, launched through Open District Heating in 2014, is built on strong collaboration between the municipality, energy utility Stockholm Exergi, power company Ellevio, and other partners. Together, they simplified permits, invested in infrastructure, and created a payment model to attract data centres. By 2022, 20 suppliers delivered 100 GWh annually, heating 30,000 apartments and cutting emissions by 50 g CO_2/kWh. This case shows how cross-sector partnerships and existing infrastructure can accelerate the energy transition.
Szeged	Hungary	Szeged, Hungary's third-largest city, is implementing Europe's largest geothermal district heating renovation to cut emissions by 40% by 2030. Its district heating network, spanning 250 km and serving around 27,000 households, previously relied on imported natural gas. Since 2018, the system has been transformed, with 50% of heat now supplied by deep geothermal energy from wells 1.7–2 km deep. This shift replaces 20 million m^3 of natural gas annually, reducing CO_2 emissions by nearly 40,000 tons. Future steps include using residual heat with heat pumps, improving building insulation, and capturing methane from geothermal reservoirs to further decarbonise the system.
Tallinn	Estonia	Tallinn, Estonia, aims to fully decarbonise its district heating by 2030 as part of its climate neutrality target for 2050. Currently, 70% of district heating is renewable, primarily from biomass residues and solar energy. The city is partnering with Utilitas through a joint company, Utilitas Tallinna Soojus, to implement the "From Little to Zero" carbon neutrality strategy. Plans include large-scale heat pumps using seawater and treated wastewater, alongside district cooling to address rising summer temperatures. Key challenges involve connecting remaining buildings, incentivising households to switch from gas, and upgrading infrastructure. Waste heat recovery and renewable integration will be essential for achieving carbon neutrality.
The Hague	Netherlands	The Hague is advancing toward climate neutrality by 2030 with a clear committment of phasing out natural gas for heating. Central to this effort is the district heating strategy, leveraging geothermal, aquathermal, and residual industrial heat from the Port of Rotterdam. To implement this complex transition in a dense city, The Hague established a multi-stakeholder governance framework, including residents, businesses, and civil society, fostering trust and local engagement. Mini-grids and scalable solutions precede full network integration, ensuring inclusivity. Combined with insulation measures and neighbourhood initiatives, the city aims to provide affordable, reliable, and low-carbon heat while empowering citizens in the energy transition.

Turku	Finland	Turku, Finland, aims for carbon neutrality by 2029, with district heating—serving 90% of households—at its core. The Kakola heat pump facility uses purified wastewater to produce both heating and cooling, covering 8% of the city's district heating and 85% of district cooling. The district heating system is 89% renewable, using biomass, waste heat, and electric boilers. Collaboration between the city, Turku Energia, and local businesses has supported over €500M in investments, including a large solar park. Further steps include expanding the use of waste heat, electric boilers, and energy storage to achieve carbon neutrality.
Valladolid	Spain	Valladolid is decarbonising its heating sector by expanding district heating networks city-wide by 2030, aiming to replace individual fossil fuel systems. Currently serving three districts, the network—powered largely by local biomass—will eventually cover 200 km and reach over 65,000 homes. Collaboration with public operator Somacyl has been key, starting with municipal buildings and expanding outward. Residents benefit from reduced heating bills and maintenance costs, boosting adoption. The city is also exploring green hydrogen to further diversify clean heat sources. This shift supports both climate goals and a circular economy rooted in regional forest management.
Vantaa	Finland	Vantaa, Finland, aims for carbon neutrality by 2030 and carbon negativity thereafter by transforming its district heating network, which serves 70% of buildings and 90% of residents. Operated by city-owned Vantaa Energy, the system has shifted from fossil fuels to waste-to-energy and biofuels, reducing emissions by 50% since 2010. Waste incineration now converts over 90% of mixed waste into heat and electricity, supplying homes and businesses. Future plans include carbon capture, underground heat storage, and hydrogen production, with waste heat from these processes fed back into the network. The approach combines circular economy principles, low energy prices, and municipal collaboration.
Vari-Voula-Vouliagmeni	Greece	Vari-Voula-Vouliagmeni, in Attica, Greece, is upgrading seven municipal buildings to improve energy efficiency and reduce emissions. The project replaces conventional oil boilers with high-efficiency heat pumps, integrates photovoltaic panels for clean electricity, modernises lighting with LEDs, and enhances insulation. Expected results include a reduction of 319 tonnes of CO_2 per year and generation of 285,904 kWh annually, benefiting 6,540 residents. The initiative focuses on municipal buildings, particularly schools, and actively engages the community through campaigns, educational activities, and stakeholder outreach, raising awareness of sustainable practices while promoting energy-efficient, climate-resilient public infrastructure.
Vasaa	Finland	Vaasa, Finland, is advancing its district heating decarbonisation through the Vaskiluoto heat storage system, developed by EPV Energy and Vaasan Sähkö. The system repurposes former oil storage caverns to store heat produced from renewable sources, enabling efficient use of surplus energy and reducing coal consumption by over 30%. It currently supports a district heating network where 90% of energy comes from renewables and aims to fully phase out coal. Future plans include expanding storage capacity and integrating waste heat recovery. The initiative contributes to affordability, flexibility, and carbon neutrality, aligning with Vaasa's 2030 target of reducing emissions by 80%.

Växjö	Sweden	Växjö, known as "The Greenest City in Europe," is committed to phasing out all fossil fuels by 2030 and has achieved a near-complete fossil-free heating system, with over 99% renewable energy since 2020. Its municipally-owned district heating relies on residual biomass from local forestry, ensuring energy security, economic benefits, and affordable heat for residents. This transition began in the 1980s and accelerated after Växjö adopted its Fossil Fuel Free policy in 1996, cutting CO_2 emissions by more than 60%. Today, district heating serves most buildings, with renewable heat solutions extending even to smaller settlements. Växjö's model shows how local resources and municipal ownership can drive a successful, inclusive heat transition.
Velenje	Slovenia	Velenje, in Slovenia's Šaleška Valley, is redesigning its district heating system to eliminate coal dependence and transition to 100% renewable energy by 2033. Currently supplied by the Šoštanj Power Plant using lignite and some natural gas, the system faces high thermal losses and outdated infrastructure. The transformation includes major upgrades to distribution networks, efficiency improvements, and integration of renewable sources. This shift aligns with Slovenia's coal phase-out strategy and EU climate goals, ensuring a just transition for 35,000 residents. Success depends on securing funding, engaging citizens, and implementing energy renovations to reduce demand and maintain affordability.
Vienna	Austria	Vienna aims to phase out fossil fuels for heating and cooling by 2040 as part of its climate neutrality target. Nearly 90% of emissions from the building sector come from gas heating, requiring solutions for about 600,000 gas units. The "Heating and Cooling Vienna 2040" strategy includes expanding and densifying the district heating network in dense urban areas, developing low-temperature heat networks in less dense areas, and deploying renewable-based building solutions such as heat pumps and biomass. Implementation started in 2022 with pilot projects under the "100 Projects Out of Gas" initiative to test technical solutions before large-scale rollout.
Vilnius	Lithuania	Vilnius, Lithuania, European Green Capital 2025, is modernising its 760 km district heating network to support its heat transition. Serving over 7,200 buildings and delivering 2.8 TWh annually, the network has been upgraded through projects such as a Combined Heat and Power plant and pipeline replacement, reducing heat losses from 24% to 12%. The latest development is the installation of the Baltics' largest absorption heat pump (9 MW), which recovers waste heat from industrial processes, saving €1.36 million and cutting 4,000 tons of CO_2 annually. By 2030, Vilnius aims for a 90% biomass share in district heating and climate neutrality.
Vinnytsua	Ukraine	Vinnytsia, Ukraine, is advancing its heat detox despite the ongoing war, serving 400,000 inhabitants. The city prioritises resilience and energy security, ensuring heat and hot water supply during outages while aligning with EU decarbonisation targets. Key initiatives include repairing and upgrading the district heating network, installing individual heat points like heat pumps, and introducing renewable sources such as solar heat, air-based heat, and biogas. The Vinnytsia Regional Office for Decarbonisation and Energy Efficiency, opened in 2024, supports citizens and businesses by providing guidance, funding access, and promoting energy-efficient solutions, laying the foundation for a greener, more resilient heat system.

Warsaw	Poland	Warsaw, Poland, operates one of Europe's largest district heating networks, covering 80% of residents. Currently, 70% of the network is powered by hard coal, but the city plans to eliminate coal entirely by 2035 and achieve climate neutrality by 2050. The strategy centres on integrating alternative sources such as waste heat from the metro, sewage system, and data centres, along with geothermal energy and hybrid heat pumps. A third metro line is currently under construction and has been designed for heat recovery, supplying nearby municipal buildings. Implementation of this project started in 2025. Warsaw also invests in energy storage and intelligent heat distribution to support a clean, efficient, and coal-free district heating system.

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THE Cities Heat Detox
HEALTHY HEAT FOR CITIES

#Healthy**Heat**4Cities
#Cities**Heat**Detox

The way we heat today, by burning fossil fuels, is detrimental to our environment, our health, and our society. Fossil-fuelled heating, representing 72% of buildings' heating in Europe today, contributes to climate change, energy insecurity and deteriorated air quality. There is no doubt: for a healthier and more secure future, our cities need a comprehensive cleansing of toxic heat sources.

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