Interreg North-West Europe
HeatNet NWE
European Regional Development Fund

Codema
Dublin's Energy Agency

Developing District Heating in North-West Europe

A Guide for Public Sector Organisations

What is District Heating?

District heating is a network of insulated pipes that delivers heat from a central energy source to provide space heating and hot water to the buildings connected to the network.

It has the flexibility to combine multiple locally-available, renewable and low-carbon heat sources; this means that it is not dependent on one single heat source and can provide a more reliable, continuous and competitive service. District heating can also recycle the heat produced from activities such as electricity generation or industrial processes and use this to heat homes and businesses in the area.

The most advanced form of district heating (known as 4th Generation District Heating or 4DHC) delivers a lower temperature of hot water, resulting in less heat loss through pipes, improved efficiencies and a wider range of heat sources.

“Despite its many benefits, district heating currently accounts for just 2-7% of total heat demand in North-West Europe”

Current Situation

Despite its many benefits, district heating currently accounts for just 2–7% of total heat demand in North-West Europe, meaning that the majority of heat in this region is supplied through carbon-intensive, fossil fuel boilers. This is in stark contrast to leading cities in Northern Europe such as Copenhagen, where 98% of buildings are supplied through district heating networks. This highlights the need to develop more sustainable low-carbon methods for heating public and private buildings in North-West Europe, and public sector organisations can lead by example by supporting, implementing and connecting to district heating networks in their region.

Image courtesy of Aberdeen Sports Village

Benefits for Public Bodies

District heating can provide numerous environmental, economic and social benefits for public sector organisations. For example, it can contribute significantly to EU and national energy targets, through a reduction in carbon emissions and a greater uptake in renewable energy. It is also a more flexible and reliable system and can provide a sustainable revenue stream for public sector organisations. District heating can also improve the energy ratings of buildings connected to it, providing a better level of comfort while helping to reduce fuel poverty for tenants.

Environmental benefits

- Reduced carbon emissions
- Contributes to EU and national energy targets
- Reduced dependency on fossil fuels
- Greater use of renewables for heating
- Better air quality

Economic benefits

- Lower energy and maintenance bills
- Sustainable revenue stream
- Local job creation
- Cost-effective compliance with building regulations
- More attractive to industry

Social benefits

- Reduced fuel poverty
- Better energy ratings
- Improved comfort
- Greater security of supply
- Hot water on demand

How do I know my area is suitable for district heating?

The high-level feasibility for developing district heating within an area is normally determined by the heat density of that area, which is usually measured in TJ/km^2. According to Danish municipalities, areas with a heat density greater than 150 TJ/km^2 are deemed technically and economically suitable for developing traditional district heating systems. The heat density is particularly important to the system's economic viability, as it becomes cheaper to implement when buildings are closer together (due to shorter pipe lengths), resulting in lower up-front investment costs and increased cost-effectiveness when compared to individual heating systems. These shorter pipelines also result in lower heat losses and reduced pumping, which reduces the operational costs of the network.

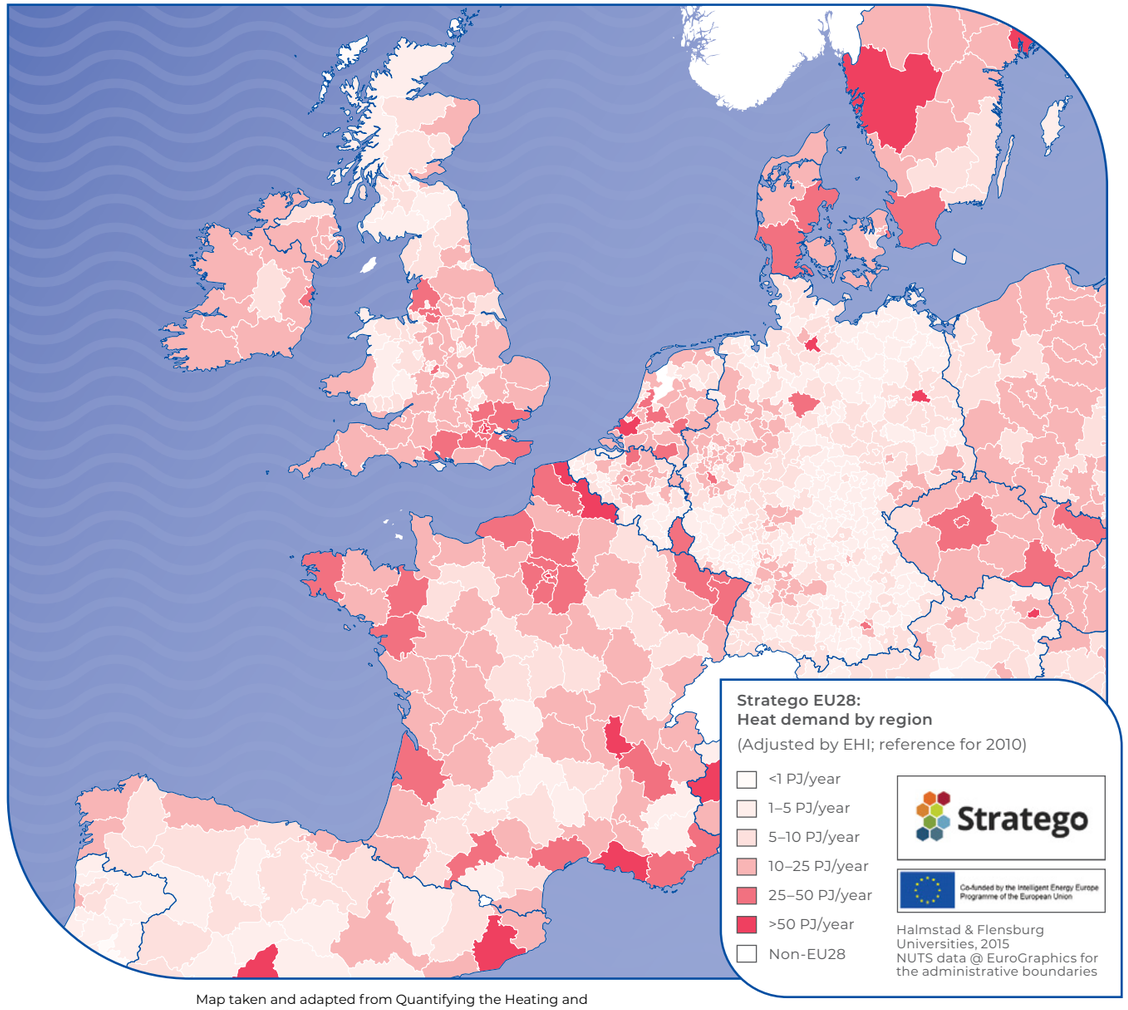
Therefore, district heating is particularly suited to dense urban areas, such as large cities and towns, which typically have the supply (i.e. an abundance of heat sources) and demand (i.e. a strong customer base) to make a network viable.

Many public buildings are ideal for district heating as they have long operating hours with large space heating and hot water demands. Public sector tenants can also bring more security to a district heating system in terms of connection and payment reliability.

To guide public sector organisations in assessing the feasibility of district heating systems in their region, the HeatNet NWE partners are developing Transition Roadmaps, which will outline their experience in developing six district heating pilots across North-West Europe and will cover areas such as the roles and responsibilities of stakeholders, regulation and policies, spatial planning, business models and viability, and connection to finance and markets.

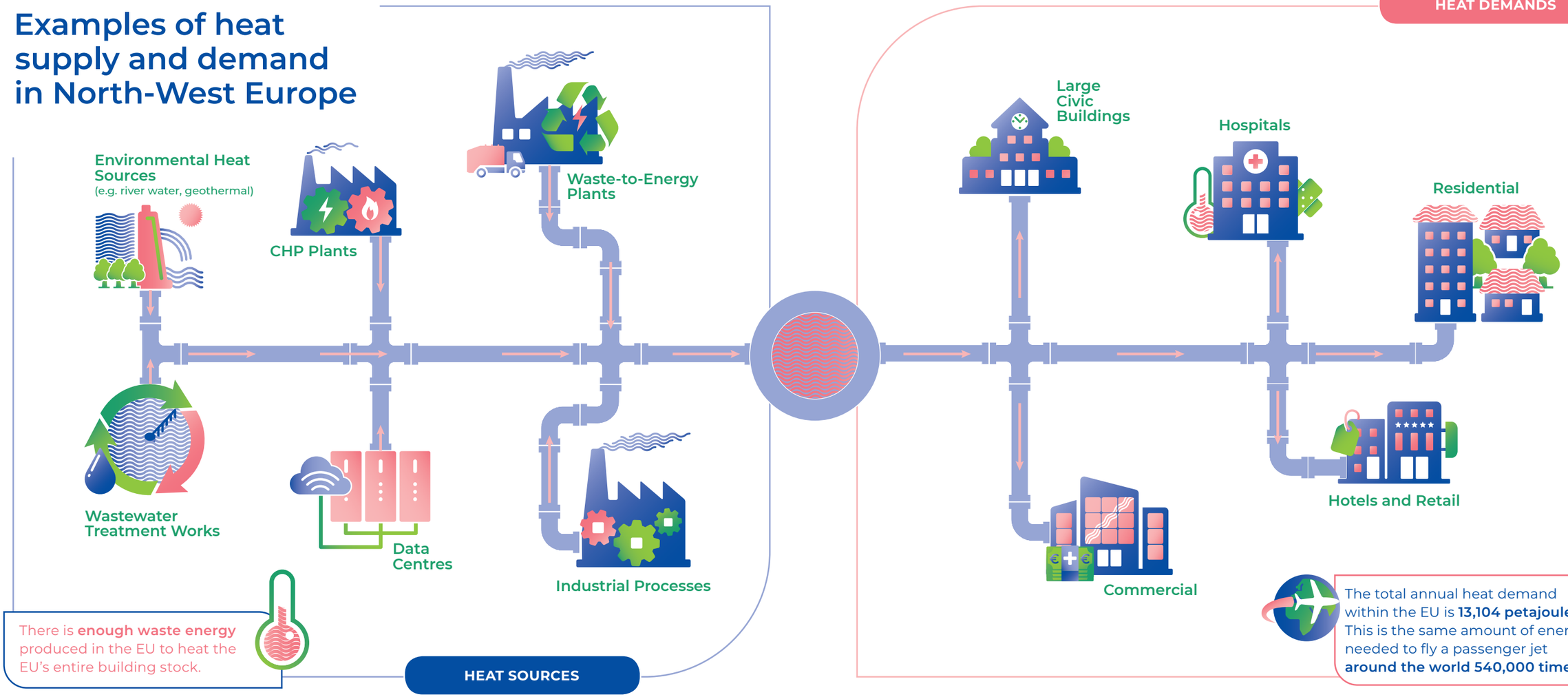
Please visit **www.nweurope.eu/heatnet** for more information on this.

"District heating is particularly suited to dense urban areas, such as large cities and towns"



Map taken and adapted from Quantifying the Heating and Cooling Demand in Europe Report - Stratego Project

Examples of heat supply and demand in North-West Europe



There is **enough waste energy** produced in the EU to heat the EU's entire building stock.

The total annual heat demand within the EU is **13,104 petajoules**. This is the same amount of energy needed to fly a passenger jet **around the world 540,000 times**.

Business Models and Project Financing

There are many different types of business models available to public sector bodies when implementing a district heating network. These range from being fully-owned, operated and maintained by the public body itself right through to full privatisation, with various levels of public-private partnerships in between.

The business model selected by the public body will be determined by factors such as the overall objectives of the project, the attitude to risk, finance available and what level of control the organisation would like to have over the project.

No matter what type of business model is selected, district heating projects generally require significant up-front investment. This is mostly for the pipe network infrastructure, and as the pipes have a typical lifespan of more than 40 years, district heating projects should be seen as long-term investments. In countries where district heating is less established, it is likely that a mixture of funding streams will need to be used, such as public and private finance, government incentive schemes, or EU funding.

PUBLIC SECTOR MODEL

STRENGTHS

- Can access public sector financing
- Revenue generation for municipality
- Greater control on flexible development, tariffs and network growth
- Can deliver aggregate demand and provide public sector anchor loads and reduce demand risk

WEAKNESSES

- Public body must carry technical and commercial risk
- Longer public sector procurement process
- Reduced access to equity funding
- Lack of ring-fenced budget can create risk on internal department budgets

PUBLIC/PRIVATE HYBRID SECTOR MODELS

STRENGTHS

- Transfers more of the technical and commercial risk to the operator
- Shorter private sector procurement may be possible
- May be able to leverage third-party financing or can draw public sector financing

WEAKNESSES

- Reduced control from public partner in certain aspects
- May need to provide higher rates of return which may result in higher tariffs and reduced flexibility
- Possible early exit by partner may compromise project objectives
- In concessions, liabilities may be consolidated into public sector accounts

Taken from the International Energy Agency Annex XI Report 2017

RISK & CONTROL ALLOCATION

PUBLIC → PRIVATE

	1	2	3	4	5	6	7	8
DESCRIPTION	Entirely public sector led, funded, developed, operated and owned	Public sector led, entirely publicly funded, greater use of private-sector contractors	Public sector led, private sector invests/takes risk in some elements of the project	Joint Venture: public sector and private sector partners take equity stakes in a Special Purpose Vehicle	Public funding to incentivise private sector activity	Private sector ownership with public sector providing a guarantee for parts of the project	Private sector ownership with public sector facilitating by granting land interests	Totally private sector owned project
RISK	Public sector retains all the risk	Private sector assumes design and construction risk, and possibly operational risk	Private sector takes risk for discrete elements (e.g. generation assets)	Risks shared through joint participation in Joint Venture vehicle/regulated by shareholders' agreement	Public sector support only to economically unviable elements	Public sector underpins key project risks	Private sector takes all risk beyond early development stages	Private sector carries all the risks
LOCAL AUTHORITY	Public sector procures contracts for equipment purchase only. Procurement could be direct, or via a publicly owned arm's-length entity	Public sector procures turn-key asset delivery contract(s), possibly with maintenance and/or operation options	As in Option 2 but with increased private sector operational risk, and payment or investment at risk	Joint Venture: both parties investing and taking risk	Public sector makes capital contribution and/or offers heat/power off-take contracts	Public sector guarantees demand or takes credit risk	Public sector makes site available and grants lease/licence/wayleaves	Zero or minimal public-sector role (e.g. planning policy, stakeholder engagement)

Source: Delivery Structure Risk Allocation and Roles (IEA Annex XI Final Report 2017)

Further Information

This guide has been developed as part of the HeatNet NWE project, which is part-funded through the Interreg NWE programme and aims to increase the uptake of 4DHC networks across North-West Europe. As part of this project, the partners are developing the *HeatNet Model*, which will help the public sector to begin implementing 4DHC networks, and the *Transition Roadmaps*, which will outline the partners' experience in developing six district heating pilots across North-West Europe. *The HeatNet Guide to Financing* is also currently being developed and will give a broad overview of the various sources available to finance district heating schemes.

For further information on these reports and on the HeatNet NWE project, please visit: **www.nweurope.eu/heatnet**.

If you are interested in developing a district heating project within your public sector organisation and would like further information, please contact your local contact point within the HeatNet NWE project (see individual contact details on the next page).

HeatNet NWE Local Contact Points

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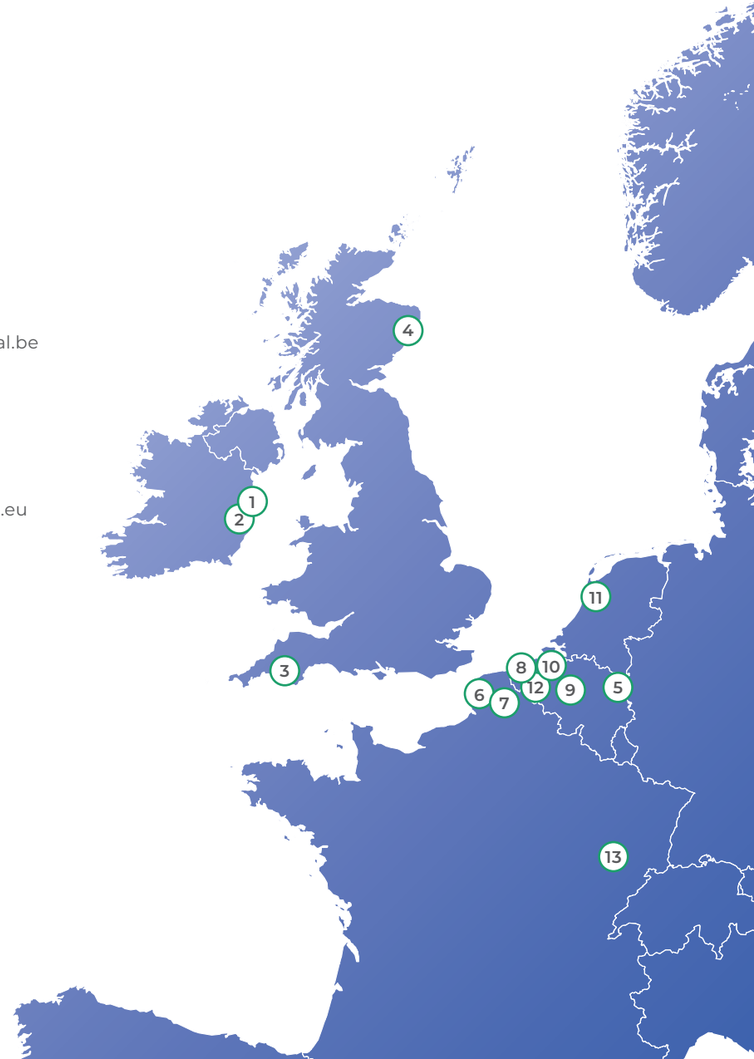

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