Codema
Dublin's Energy Agency

Maynooth District Heating Feasibility Study

External summary document

Comhairle Contae Chill Dara
Kildare County Council

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Dublin's Energy Agency

Executive summary

Main message

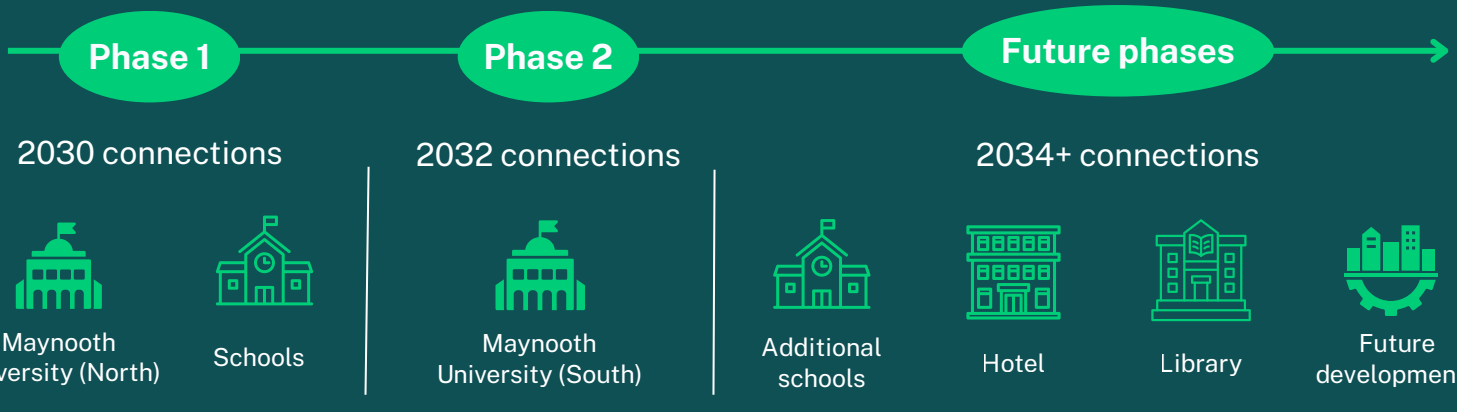
With the right support, funding and engagement in place, this study highlights that **district heating is technically and economically feasible for Maynooth**.

Preferred route

A preferred route for the district heating network has been chosen to **reduce disruption and costs while allowing for future growth**. It starts at the Maynooth University North Campus and extends eastwards to Maynooth Boys' National School and Stepping Stones Special School.

Shallow geothermal is the most viable heat source, taking heat from the upper layers of soil up to 400m below the surface.

Switching to district heating will reduce emissions equivalent to removing 1,170 diesel cars from the road each year.



Introduction to district heating

District heating is an innovative and efficient way to supply heat to buildings from a centralised source. Instead of each building using its own boiler or heat pump, a network of insulated underground pipes distributes hot water or steam from a central plant to multiple buildings.

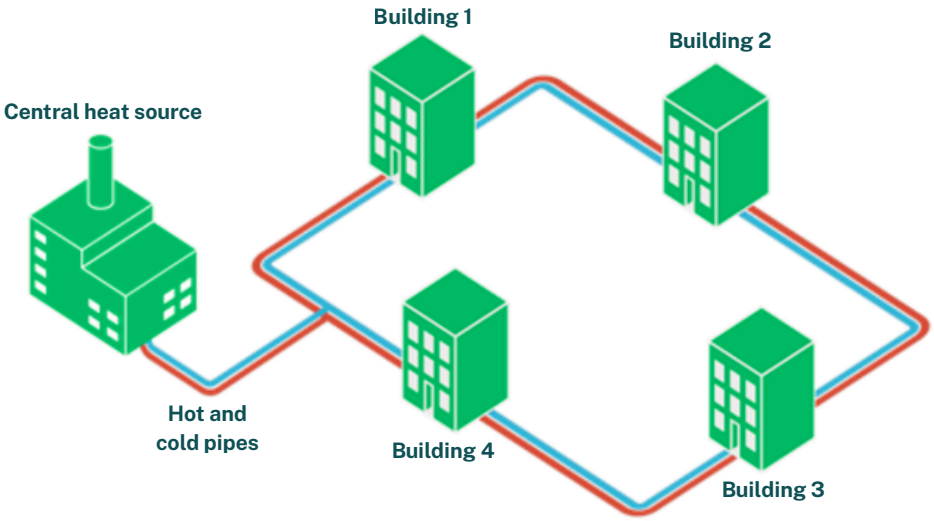


Figure 1: District heating diagram

Key advantages of district heating

Flexibility: District heating can use heat from many different sources. It can combine various renewable and low-carbon heat sources, including biomass, geothermal and waste heat from industrial processes or data centres.

Environment and climate: District heating is a vital tool in reducing greenhouse gas emissions and enhancing local air quality.

Legislation: District heating also aligns with local, national and EU-level climate goals; the European Union recognises district heating and cooling as critical components of its Energy Efficiency and Renewable Energy directives, while the Heat (Networks and Miscellaneous Provisions) Bill 2024 is in development to provide a legislative and regulatory plan for the district heating sector in Ireland.

Other benefits of district heating

What makes district heating feasible?

District heating is most effective in areas with **high building density**, where many heat users can be connected within a local network. In low-density or dispersed communities, the cost of laying extensive pipework relative to the heat demand makes the system less economically-viable. These areas are often better suited to individual, low-carbon solutions, such as heat pumps, which require less infrastructure and can be tailored to single-building needs.

High-density areas

District heating is effective in areas of high building density where mutliple users can connect to a local network.

Low-density areas

Low-density and dispersed communities are better suited to individual, low-carbon solutions such as heat pumps.

Rolling out district heating in Ireland

While district heating offers many environmental and efficiency advantages, it is a relatively new concept in Ireland and its use has been limited for a number of reasons. It requires **strategic, long-term planning and coordination** across local authorities, developers and utility providers. The initial infrastructure investments (such as underground insulated pipe networks and centralised energy hubs) are substantial but they lay the foundation for a clean, scalable heating solution.

Success also relies on connecting a sufficient number of users to achieve **optimal performance and cost-effectiveness**. In areas where heat demand is spread out or where shared heating systems weren't planned before, rollout may take longer. However, as policy, public awareness and technical experience grows, **district heating is well-positioned to become a central part of Ireland's low-carbon energy transition**.

Examples of district heating in Ireland

Although district heating is still in its early stages in Ireland, progress has been made. The **Tallaght District Heating Scheme**[1], developed by South Dublin County Council in close partnership with Codema, Dublin's Energy Agency, became operational in 2023 and is Ireland's first large-scale district heating network. It captures waste heat from an Amazon Web Services data centre and supplies South Dublin County Council buildings, a number of Technological University Dublin's Tallaght campus buildings and local, cost-rental apartments. The network is set to expand even further in future phases.

The **Dublin District Heating System**[2] is also being developed to use waste heat from the Dublin Waste-to-Energy Plant in Poolbeg to supply homes, businesses and public buildings in the surrounding area. Several other heat network developers and local authorities are actively developing schemes and feasibility studies for district heating networks, with the goal of rolling out sustainable heating solutions in their regions.

There are also district heating projects being spearheaded outside of Dublin. One example is the **Galway District Heating Project**[3], being developed by HeatGrid Ireland. Currently progressing through planning applications with Galway City Council, the project plans to deliver heat to a mix of public sector, commercial, industrial and residential buildings across the city. The network will primarily use renewable electricity to generate low-carbon heat, displacing fossil fuel use in individual buildings and supporting decarbonisation goals.

[1] https://heatworks.ie/

Image: Tallaght District Heating Scheme

The potential for district heating in Maynooth

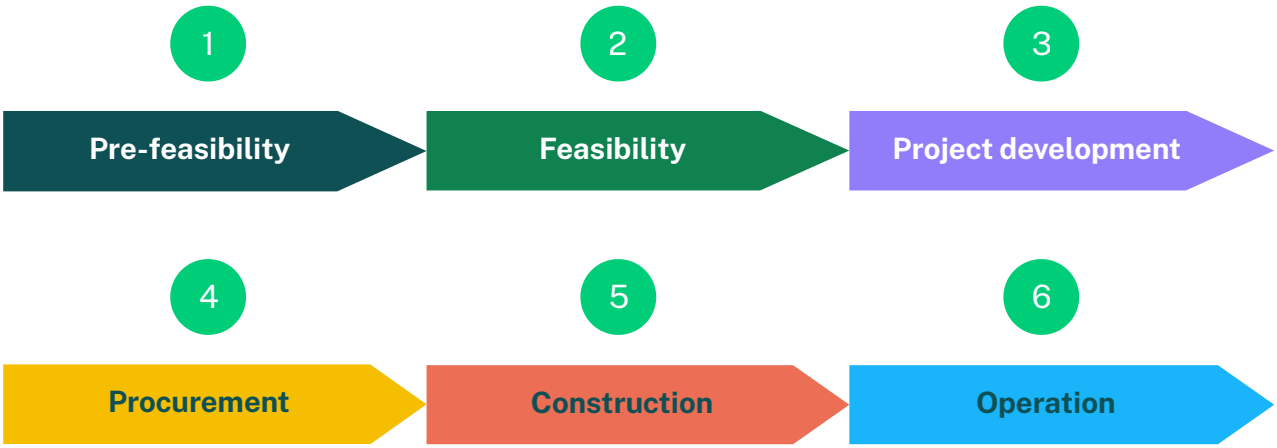
Maynooth was identified as a candidate for district heating for several interconnected reasons. As a growing town anchored by a university, it has a dense concentration of public, commercial and residential buildings, presenting a valuable opportunity to introduce an efficient, low-carbon heat network capable of scaling over time. The university campus in particular presents an opportunity as a large landholder with significant heating demand.

The undertaking of a feasibility study is further supported by Kildare County Council's climate action ambitions as set out in its Climate Action Plan. Maynooth has been classified as a Decarbonising Zone (DZ) under KCC's Climate Action Plan[4]. A DZ is a specific area chosen by the local authority where a range of low-carbon solutions can be tested to address local energy and climate needs. Through an assessment of the technical, financial and environmental considerations, the study aims to inform a clear pathway towards low-carbon heat delivery, reduced emissions and enhanced energy resilience within Maynooth's active urban centre.

[2] Kildare County Council Climate Action Plan 2024-2029. Link to Climate Action Plan

District heating development process

The development of a district heating system typically follows a structured process, beginning with a **conceptual exploration and pre-feasibility stage**, progressing through detailed **feasibility assessment** and ultimately leading to **design, financing, procurement and implementation**.



Current study

The current study for Maynooth represents the **feasibility stage** of this process and follows on from an initial pre-feasibility assessment carried out by Codema in February 2025. The pre-feasibility study involved high-level mapping and stakeholder identification.

The feasibility study aims to assess whether a district heating scheme is technically, financially and environmentally-viable within the town. This includes:

- A **heat demand analysis** to identify suitable heat sources and map potential demand
- A **route analysis** to evaluate network routes
- A **financial assessment** to estimate capital and operational costs.

This study follows the SEAI's district heating feasibility study how-to guide as a standardised approach.[5]

The study provides a solid evidence base to inform decision-makers, helping them determine whether to proceed to the next stages - namely detailed design, stakeholder engagement, business planning and ultimately, infrastructure development.

Heat demand analysis

The heating network has been designed to serve local schools and buildings on the Maynooth University campus. However, the early stages of implementation present several challenges. Codema identified several constraints during the route analysis and these are discussed in more detail in the following section. In addition, some potential customers, particularly private users, may be hesitant to connect if the scheme cannot provide a heat supply that is cost-comparable with fossil fuel alternatives. For this reason, early engagement is focused on public sector buildings with decarbonisation targets and on buildings with large, consistent heat demands.

Buildings with large demands could offer a strong, steady “base load”, which improves the operation of the network. These buildings are also known as “anchor loads”, due to how central they are to the running of the network. These anchor loads - along with reliable public sector connections - are then prioritised for the initial phases. When the network is running, new customers may be more eager to join when pipes are in the ground. For this reason, a phased rollout was considered, as seen in the table on the next page, to facilitate a smooth rollout and ensure early returns from anchor clients while enabling future growth. It is envisioned that other customers such as hotels and future residential developments can connect in future phases.

Anchor load

Buildings with large heat demands that can offer a strong, steady demand on the network. These buildings are considered crucial to the running of the network due to their heat demand.

Phased rollout

Table 1: Phased connections

2030	**Buildings**	
1		Maynooth University North Campus School 1 School 2
2032	**Buildings**	
2		Maynooth University South Campus
2034	**Buildings**	
3		School 3 School 4
2036	**Buildings**	
4		School 5 School 6 School 7
2038	**Buildings**	
3		Library School 8 Business 1
2038+	**Buildings**	
3		Future developments

Route analysis

As part of the feasibility study, Codema assessed three potential network routes. Of these, the second route was identified as the optimal pathway for linking the key demand zones. This route **enables immediate connection to the major anchor user**, the university campus.

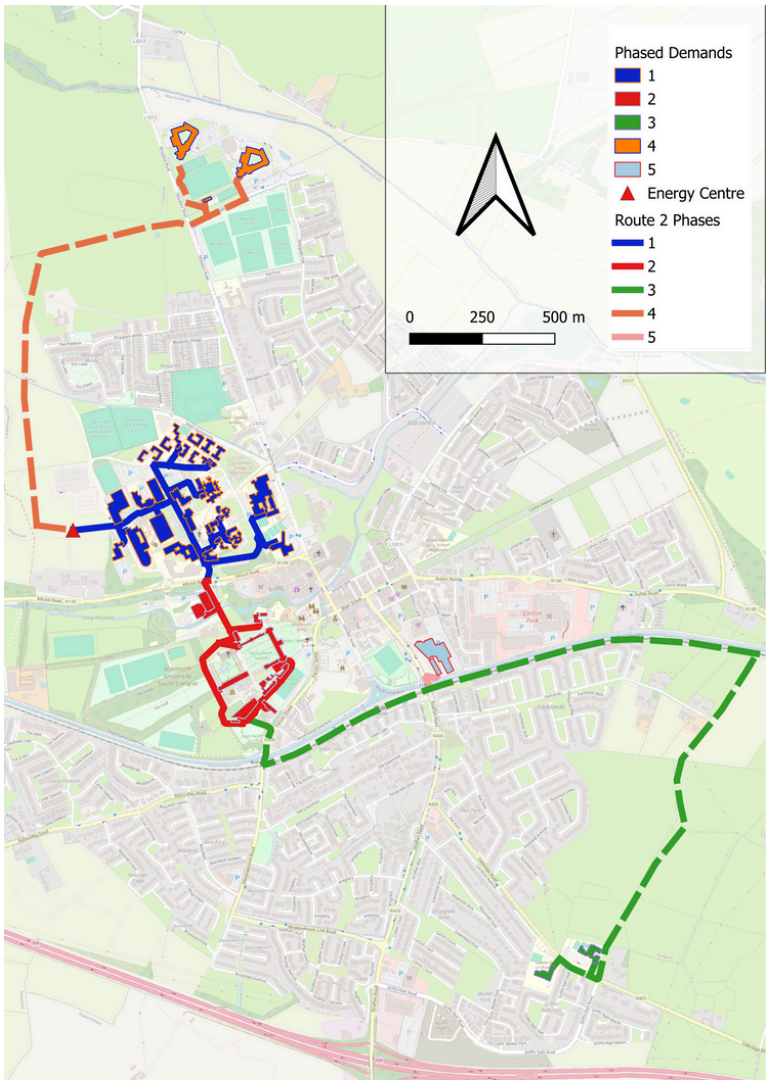


Figure 2: Route mapping

The selected route begins at the energy centre and connects first to the North Campus. In the initial phase, it also extends eastwards to connect two schools. A second phase would then connect to the South Campus, enabling the entire university to be served. **This route is indicative and may be adapted to reflect the context in which the network is delivered**. Where other roadworks are underway, opportunities to extend beyond the campus to connect additional, major heat users should be considered.

Further expansion beyond this point is not recommended at this stage due to significant constraints in the town centre, particularly the bottleneck along Leinster Street. Any roadworks in this area, where no alternative access routes exist, would cause substantial disruption to the local area and should therefore be avoided. The potential development of future ring roads may provide alternative routing options throughout the town in the longer term.

Heat source analysis

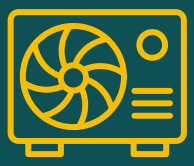
Codema carried out a detailed evaluation of potential heat sources in the area, considering options like geothermal energy, heat recovery, biomass and large-scale, air-source heat pumps. Each option was assessed for cost, technical feasibility and environmental impact.

Heat sources assessed

Waste heat recovery

Using heat generated by operations at wastewater treatment plants or industrial activities

Air-source heat pump



Taking heat from the air outside and using electricity to raise the temperature through large-scale heat pumps

Shallow geothermal

Using heat from the upper layers of the soil, typically up to 400m below the earth's surface, requiring land for boreholes

Biomass

Using animal or plant matter from farming processes or agrifood operations to create energy for heating

Preferred heat source

Among all options, the shallow geothermal option stood out as the most viable heat source. Shallow geothermal systems extract heat from the upper layers of soil, rock or groundwater, typically up to depths of less than 400m below the earth's surface. Ground-source heat pumps are then used to boost the heat and transfer it into buildings or district heating networks.

Although this technology is relatively new in Ireland, early assessments are promising. Tools developed by Geological Survey Ireland indicate that **several areas of Maynooth have favourable conditions for shallow geothermal systems**. There is also potential for deep geothermal resources thanks to a geological fault line that runs through the Irish Midlands, passing close to the northern edge of Maynooth. A detailed site investigation would be necessary to confirm the feasibility of a shallow geothermal scheme while also assessing whether subsurface conditions could support deep geothermal development.

If suitable, it can provide a **large, consistent supply of low-grade heat**, can be **situated near the planned distribution network** and **provides a security of supply**. Each option assessed was modelled with a gas boiler backup, including the shallow geothermal option. This is to provide heat in peak times or when the heat pump may be down. The costs and emissions associated with this gas backup have also been considered.

Financial analysis

The project requires a total capital investment (CAPEX) of €10.6 million. This investment includes all infrastructure, construction and integration of customer connections.

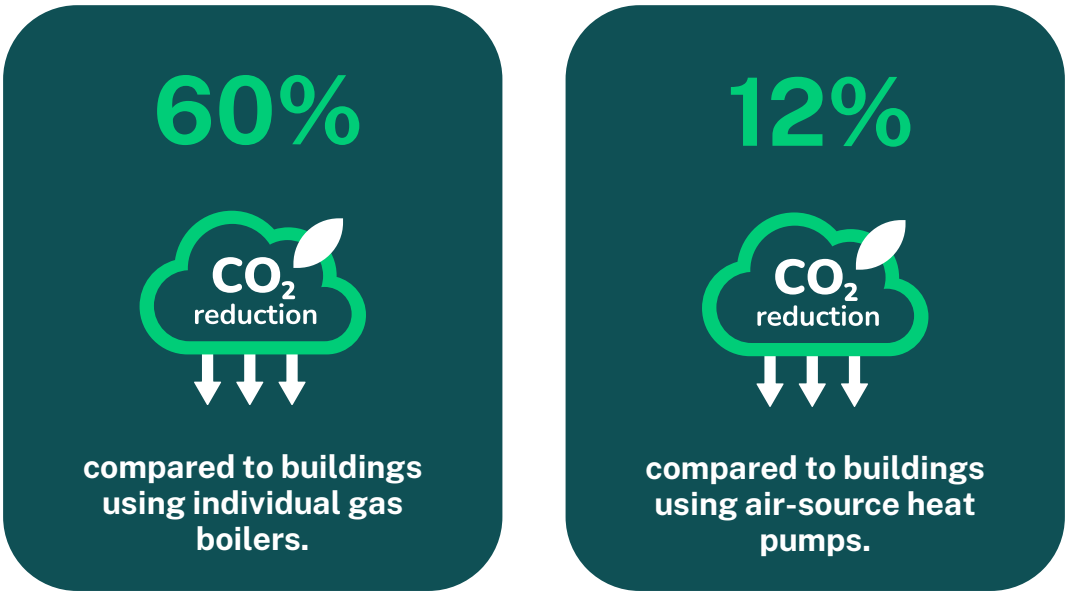
- **Total CAPEX (core scheme with Route 2)**: Approximately €10.6 million, (+/- 20%, including contingency costs)

- **Payback period:** 25 years

These figures demonstrate that, with targeted support, grant funding from the Infrastructure, Climate and Nature Fund and continued stakeholder engagement, the project is financially-viable and capable of delivering value over its lifetime. While its lengthy payback period makes it unsuitable for private investment, this project is considered feasible as a long-term public infrastructure project. The assessment shows that district heating is financially-viable for Maynooth.

Energy and emissions savings

The proposed district heating network would deliver significant greenhouse gas savings by moving away from conventional, fossil-fuel heating systems towards a more efficient, low-carbon alternative. Compared with buildings heated by individual gas boilers, carbon emissions are expected to fall by around 60%, while emissions would be approximately 12% lower than those associated with air-source heat pumps.



District heating brings together multiple heat demands within a single, shared system, enabling much higher efficiency overall. Much like a single high-capacity train engine is more energy-efficient than many individual car engines travelling the same route, a centralised heat network delivers efficiency gains even after accounting for distribution losses. This proposed district heating network would reduce energy consumption by **6 GWh a year** and could **reduce annual emissions by up to 2,300 tonnes of CO_2**.

This is the equivalent of **taking 1,170 diesel cars off of the road each year**. As more renewable energy is integrated into the national electricity grid, the carbon intensity of district heating will continue to decrease, making it an increasingly low-carbon heat solution over time. This positions the project as a cornerstone of local climate mitigation efforts, delivering measurable and lasting environmental impact.

The proposed network would save 2,300 tonnes of CO_2, the equivalent of taking **1,170 diesel cars** off of the road.

Key considerations

Within this study, Codema identified several important factors that could influence the project's success:

Variations in energy prices

Fluctuations in **energy prices** were identified as a significant factor influencing the financial performance of the heat network. As the system relies on electricity as its primary energy source, heat costs are directly linked to movements in electricity market prices.

- This risk can be minimised through the inclusion of on-site **thermal storage**, allowing heat to be generated during off-peak periods when electricity is cheaper and stored for use during times of higher demand and cost.

Heat demand

The study also found that the scale and stability of heat demand is a critical sensitivity. The **loss of connected customers** can undermine the economic case for the network, as reduced revenues may impact long-term viability.

- Measures such as offering **competitive heat tariffs**, **engaging with customers** at an early stage and **securing long-term supply agreements** can help maintain strong connection levels over the life of the project.

Stakeholder engagement

The primary customer for the network assessed is Maynooth University. This makes the university a **key stakeholder**.

- To mitigate the risks associated with this, **structured stakeholder engagement** with the university that reinforces a **collaborative approach** to network implementation should be considered.

With these assurances, among other minor mitigation tasks highlighted for smaller risks, district heating would be suitable for deployment in Maynooth town.

Why district heating for Maynooth?

Utilising a shallow, ground-source heat pump, coupled with the preferred route identified, represents the most effective balance of technical robustness, environmental benefit and cost efficiency. This approach allows for staged implementation, accommodates future growth, and achieves meaningful carbon reductions from the outset.

When these factors are considered together, **district heating emerges as a viable solution for Maynooth**. The proposal supports local policy objectives and illustrates how sustainable heat infrastructure can deliver lasting environmental benefits alongside strong economic performance.

References

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5. District Heating Feasibility Study Standardised Template A “How-To-Guide”, https://www.seai.ie/sites/default/files/2025-03/District-Heating-Feasibility-Study-Template-How-to-Guide.pdf

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