DECARB CITY PIPES 2050

Transition Roadmap City of Dublin

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Transition Roadmap of Dublin

Introduction & Context

Heating is a hugely important sector in Ireland when it comes to decarbonisation as it represents approximately 40% of energy demand (twice the demand of electricity) and is the worst performing sector in terms of renewable proportion (currently at 6.3% of total heat production) behind both electricity and transport.

The district heating networks potential to enable greater uptake of renewable and waste heat sources is shown in the figure below, where there is a strong correlation between DH and renewable heat proportions. This relationship is now being recognised in national heat policy.

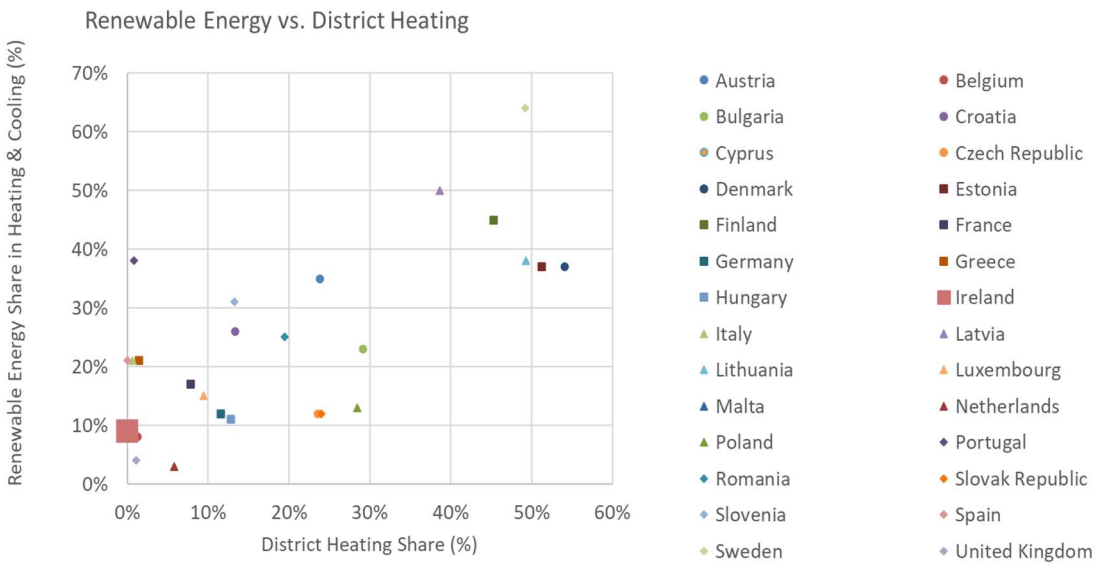

FIGURE 17: RENEWABLE ENERGY VS. DISTRICT HEATING IN EUROPE

The majority of buildings in Dublin currently use gas-fired heating. The gas grid covers practically the whole city, developed at national level by semi-state-owned companies without considering where DHC grids may be a better option. Figure 18 shows the breakdown of types of heating technologies currently installed in Dublin. Gas is by large the dominant heat fuel followed by direct electric (not heat pumps), particularly in the inner city where many apartments are heated in this way. The current distribution of fuel sources in residential dwellings reads: Gas 74% (assumedly mainly individual boilers), Electric 18% (mainly direct electric rather than heat pumps), Oil 7%, and Coal/Biomass 1% (percentages relating to the share of dwellings supplied by each respective fuel source).

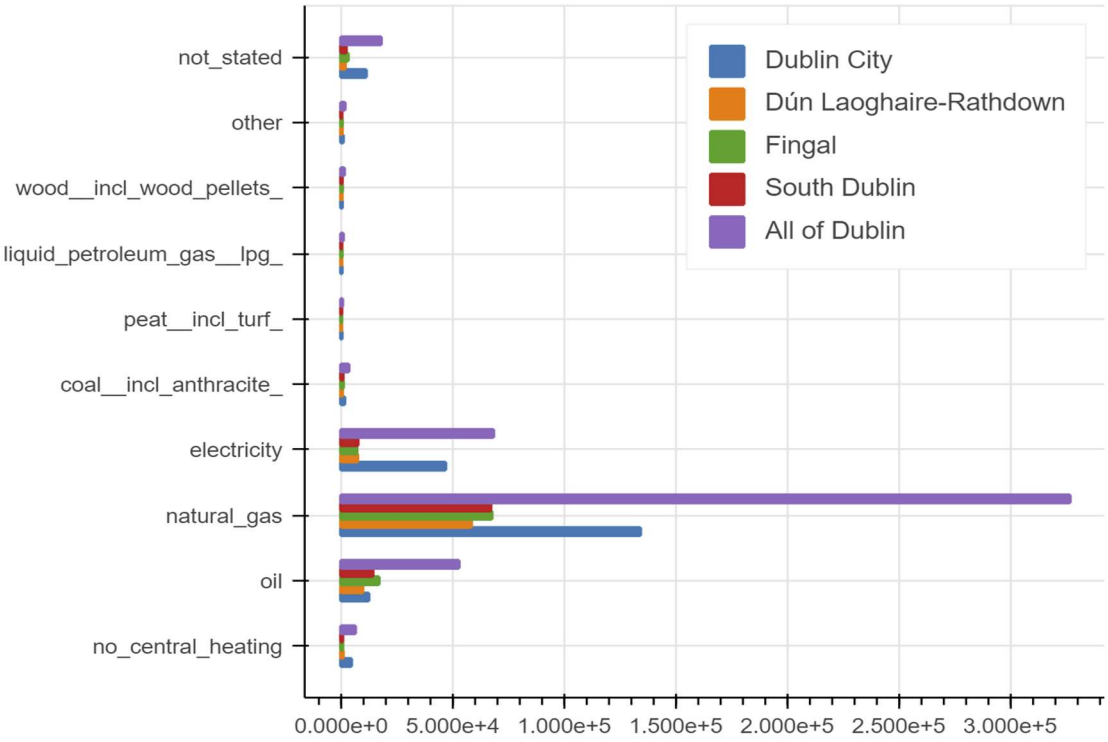

FIGURE 18: TYPES OF HEATING TECHNOLOGIES CURRENTLY INSTALLED IN DUBLIN

Currently, the heating sector has a very low penetration of renewable energy, and Ireland is the worst performing country in the EU in this regard with a renewable heat proportion of just 6.3%. The Climate Action Plan states that all buildings will need to switch to heat pumps or district heating by 2050, meaning that the gas grid will no longer supply existing homes and commercial premises.

District heating is a new technology in Ireland, currently representing less than 1% of the heat market but with potential for this to be between 57% and 54% based on a 2019 study performed by the Heat Roadmap Europe researchers and results from the SEAI's National Heat Study[12], respectively. The potential for DH has been recognised in the national Climate Action Plan 2023 where a target of 2.7TWh of heat is to be supplied via DH by 2030 (and 0.8TWh by 2025). This 2.7TWh target represents 10% of all residential and commercial heating in the country.

To support this roll out of DH, there are also actions in the Climate Action Plan 2023 where the government will:

- Support through the Climate Action Fund
- Establish a system of governance for the development of district heating policy
- Perform research to support the rollout of district heating in Ireland
- Develop a regulatory framework to protect customers & suppliers
- Ensure planning framework encourages and facilitates the development of DH – zoning of areas for DH
- Identify appropriate financing mechanisms to support delivery of DH including financial incentives similar to retrofit grant programs

[12] https://www.seai.ie/data-and-insights/national-heat-study/

- Update relevant regulatory & legislative tools to enable roll out of DH infrastructure

There is an agreement today that more bottom-up effort is required, but municipalities have a very low level of autonomy trying to find paths through their limited remit to influence the use of energy and emissions in their regions and limited municipality resources.

Importantly, Dublin has used its local working group – newly established specifically for this project – to identify actions to advance Dublin's heat transition, policy and buy-in to the low-carbon heating/cooling transition needed to overcome barriers to the roll-out of other alternatives to gas grids. The Dublin Local Working Group is made up of local, regional & national level stakeholders who are fundamental to the success of the roll-out of low carbon grids in the city.

Dublin has become a pioneer in Ireland for local level energy planning and DHC implementation, both of which are completely new practices in Ireland. Codema, as the energy agency for Dublin, has been building these skills and practices with the Dublin municipalities through numerous EU & national level projects. The municipalities have now committed to developing a city-wide DH scheme, outlined in the "Dublin City Climate Change Action Plan 2019-2024". Using learnings from the Policy Experiment (WP5) of the Decarb City Pipes 2050 project, Dublin City Council have also introduced a requirement, as part of the City Development Plan, for Energy Statements to be produced for any developments greater than 1,000 m^2 (commercial space) or 30 dwellings. The ongoing learnings from implementing this policy are also being used to refine this process.

Dublin has made significant progress in DH in the last few years. The first large-scale DH network in the county (Tallaght DH Scheme) is now operational. This DH network is the first not-for-profit public utility in the country and the first to use data centre waste heat as its heat source.

The development of a much larger DH network in the Poolbeg & Docklands area of the city is also progressing. This network will use waste heat from the Dublin Waste-to-Energy (WtE) plant as its inital primary heat source. A preliminary business case report has been produced for this project as well as extensive engagement with customers and energy service companies (ESCOs) who may be responsible for the construction and operation of the proposed network. This project is expected to go out for procurement in 2023. There has also been significant progress made in planning policy in the city to support DH, with requirements for buildings to "futureproof for connection (making buildings technologically ready to connect to DH) in certain areas of the city. €20 million in funding has also been secured for this project's development.

A feasibility study for another DH network using data centre waste heat has also been developed for the Blanchardstown area and the results of this study are currently being considered by the local municipality.

Further opportunities in areas such as geothermal DH and greater sector integration with the electricity sector (using DH + thermal storage to reduce the curtailment of renewable electricity generators) are also being progressed within Dublin.

City Profile

The table below summarises the profile of Dublin which can quickly allow other cities to see where they might have similarities.

Is heat planning mandatory in this city?	No but it has been carried out as part of the Dublin Region Energy Masterplan. Output maps on heating are available here - https://codema-dev.github.io/posts/
% of heat supplied by DH	<1%
Predominant heat source for DH	Waste heat from Data centres & WtE plant
What generation of heat networks?	3rd and 4th generation
DH ownership	Currently mainly publicly owned
National or regional targets for DH?	National target of 2.7TWh of DH by 2030 and 0.8TWh by 2025
Is there strong local engagement	Commitment from Dublin City Council to deliver DH in Dublin. This is reflected in the most recent City Development Plan where new developments of a certain size are required to be DH-enabled where feasible. Also, DCC are developing their own DH network using waste heat from Waste-to-Energy plant.
Predominant existing heating type	Individual gas boilers
Heat sources with the highest potential in Dublin	Power plants, wastewater treatment plant, geothermal, surface water, sea water

Dublin's H/C Plan – The 2050 Goal

Dublin's Heat Decarbonisation Pathway

The sections below summarise the heat sources available for use in DH networks and what are the preferred heating technologies for different areas of Dublin. This pathway was determined by the lowest cost of carbon abatement in the heating sector for DH vs ASHPs (air source heat pumps), (including Capex, Opex, Repex and CO_2 equivalents from methane and refrigerant leaks) for the period up to 2030 and 2050 (i.e. not just in that year). The key metric used was the €/tCO_2 saved. The results of this analysis can be seen in Figure 19.

The areas coloured blue are most suited to heat pumps and the areas coloured red are most suited to district heating. The darker the colour the more suited that area is to either technology.

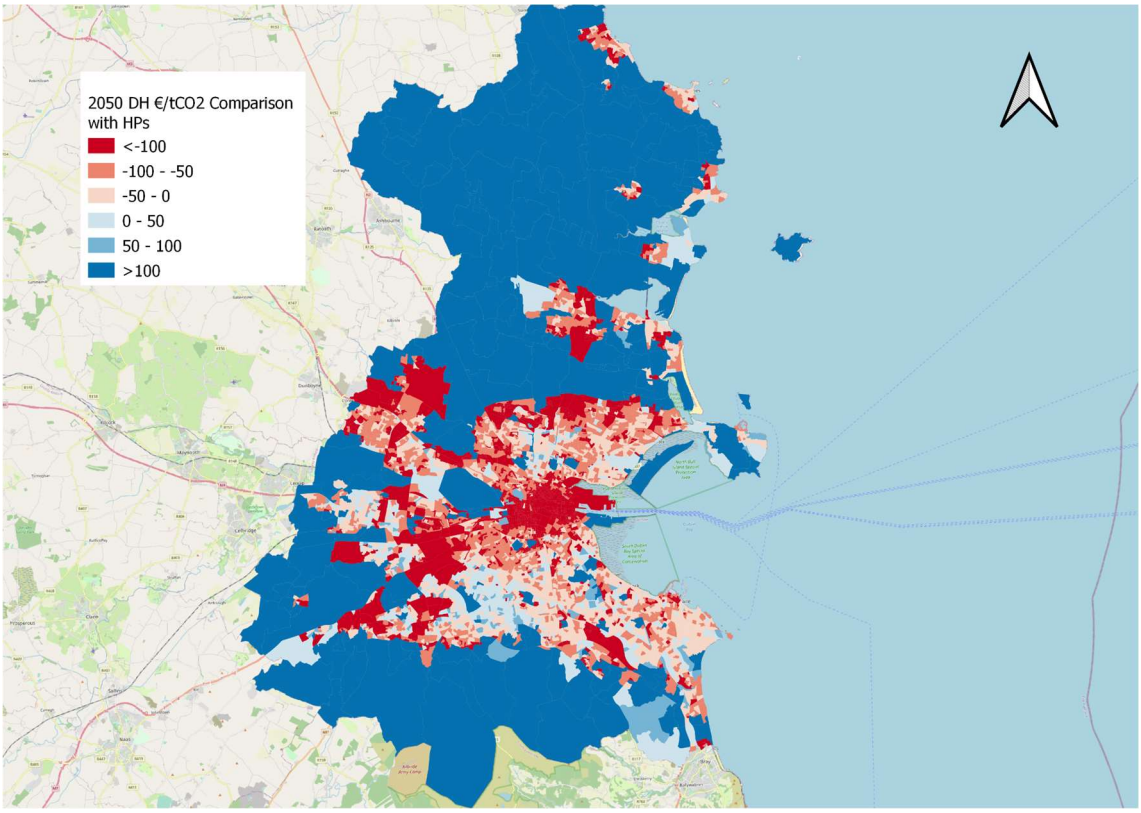

FIGURE 19: 2050 DH AND HP PRIORITY AREAS BASED ON LOWEST NON-DISCOUNTED CARBON ABATEMENT COST

By 2050, district heating represents the best option for 9.06TWh (87%) of heat demand in terms of cost-effective decarbonisation. By 2050, it is assumed that the required supply chain is in place to deliver on the full DH potential outlined. This would save 1,550.1 ktCO_2 in carbon emissions and 617.6 ktCO_2eq. in equivalent emissions in the year 2050.

The underlying assumptions and analysis which informed this map and resulting contribution fo both DH and individual heat pumps are discussed in the analysis section below.

Underlying Analysis

The decarbonisation of the gas grid is limited by the capacity to produce biomethane and by the current technical restriction on using hydrogen in existing gas infrastructure (see emissions factors in Figure 20).

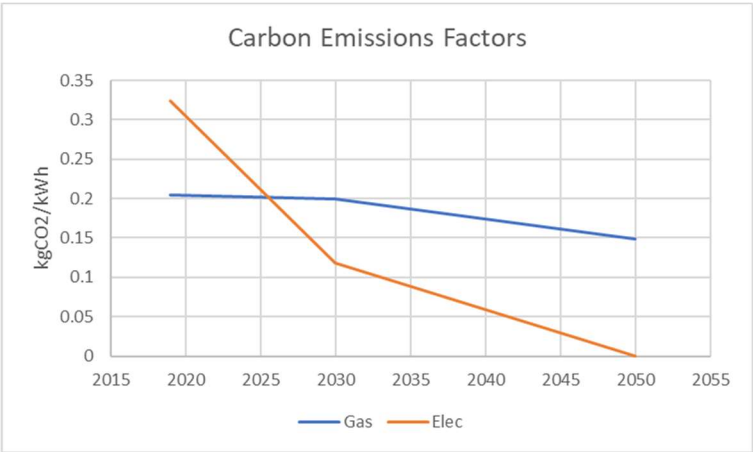

FIGURE 20: CARBON EMISSIONS FACTORS

Green hydrogen not considered suitable for low-exergy applications such as space heating and hot water preparation due to inherent inefficiency when compared with alternatives. It is also assumed that all future buildings will be nZEB, and various fabric upgrade options were considered for existing buildings.

Heat Sources in Dublin

The graph below shows the range of 18 heat sources investigated by Codema for heat planning purposes and also includes typical temperature ranges for each heat source, and highlights how that matches up against potential end-use temperature requirements.

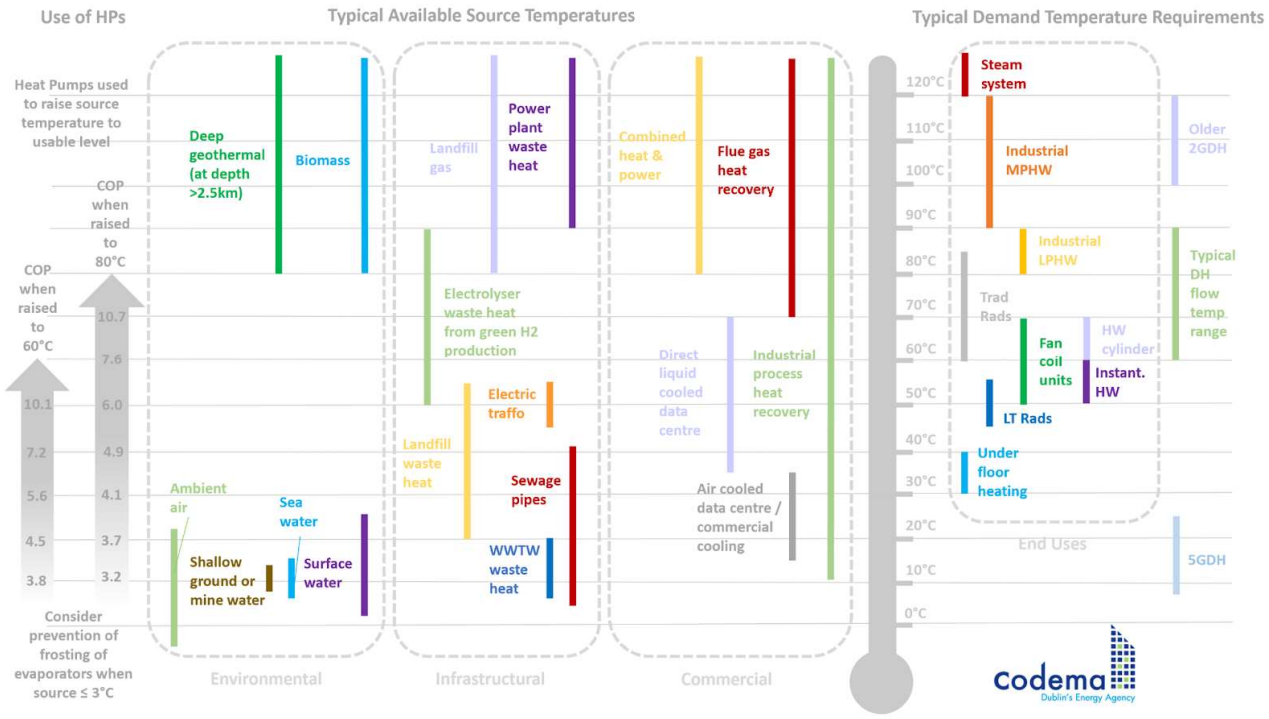

FIGURE 21: HEAT SOURCE AND END-USE TEMPERATURES

Figure 22 shows the breakdown of heat sources available in Dublin for the current and future scenario. It can be seen from this graph that the main changes over this period is the significant reduction in heat available from power plants as renewable electricity generation increases. This reduction is offset by increased heating potential from data centres and from renewable electricity generation which would otherwise be curtailed. Identifying some the main potential heat sources has helped to define some technology-specific actions in the this transition roadmap, particularly for data centres and geothermal.

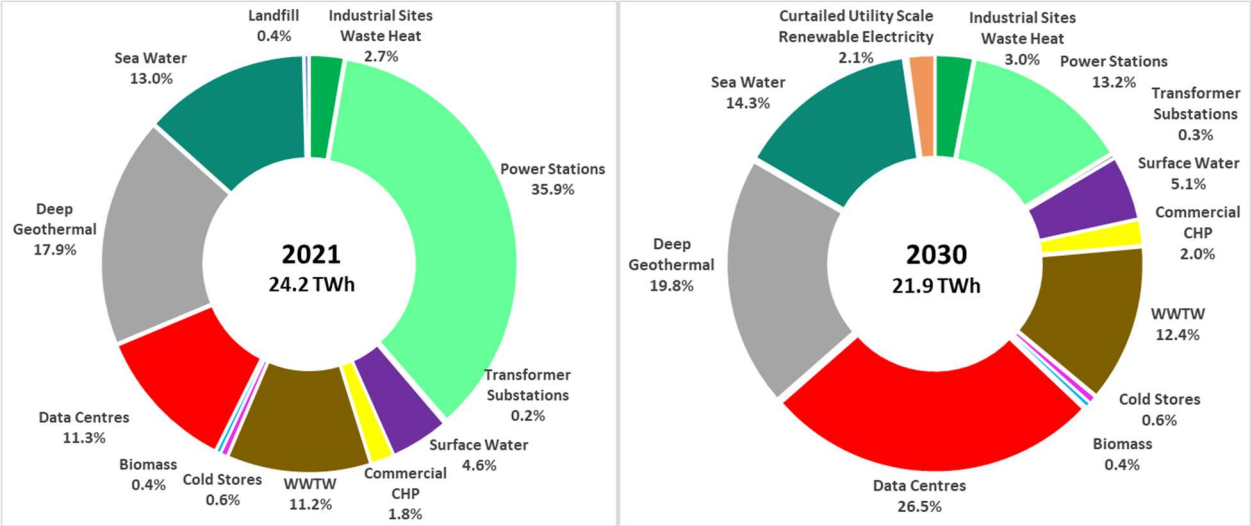

FIGURE 22: HEAT SOURCE BREAKDOWN FOR 2021 AND 2030

The location of these heat sources (totalling approximately 530 sources) is set out in the map below (Figure 23) and can also be found online[13].

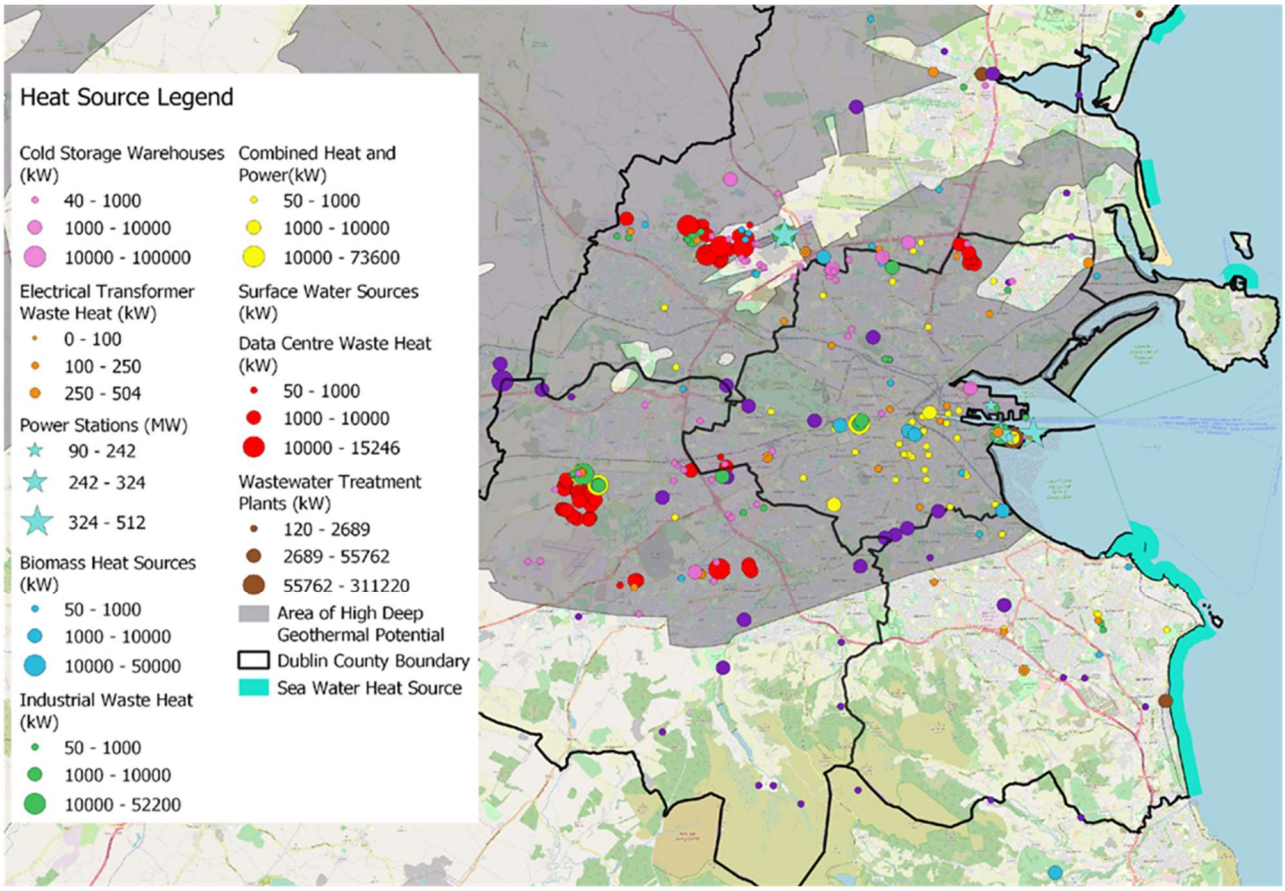

FIGURE 23: HEAT SOURCE MAP OF DUBLIN

These sources have been broken down based on their average supply temperatures in the graphs below (Figure 24). This provides an indication of the quantity of higher temperature heat that could be utilised for direct use in DH networks (>60°C) without requiring heat pumps. The medium temperature sources which can supply heat between 20°C and 60°C would likely require a heat pump to bring them up to a usable temperature for typical DH networks but these could achieve very high COPs (coefficients of performance), likely to be

[13] https://codema-dev.github.io/map/heat-source-map/

above 3.5 and perhaps up to 12 (i.e. 12 units of heat for every 1 unit of electricity). The low temperature range (<20°C) would require heat pumps to raise their temperature to a usable level. Even when using the same sources as individual building heat pumps, these large-scale heat pumps generally provide better COP than the smaller alternatives. This is due to a number of reasons: these large-scale HPs are continually monitored to ensure their performance is optimised, they have continual maintenance to ensure efficient operations, the diversity of loads being supplied lends itself to less short-cycling of the heat pump improving efficiency and the HP's lifespan, and the economies of scale allow for use of two-stage compression, which improves efficiency when using lower temperature sources.

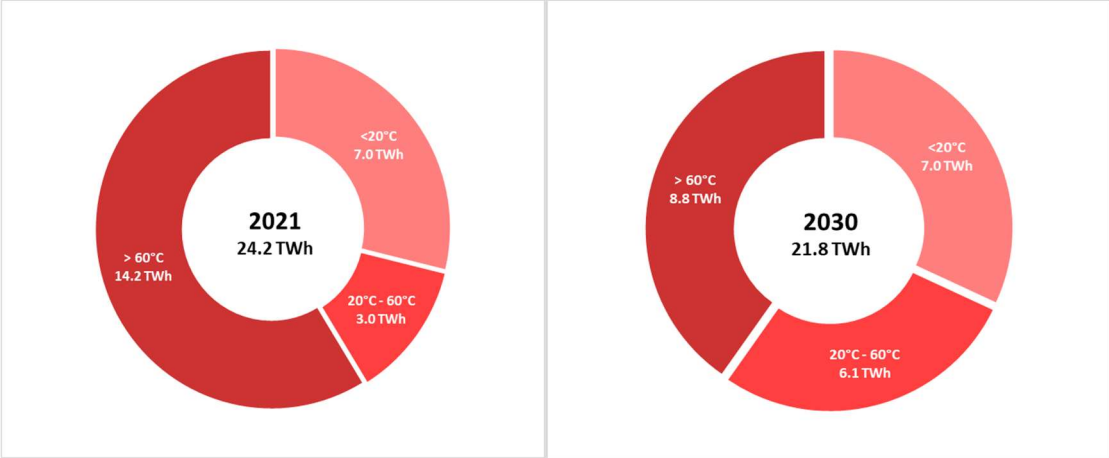

FIGURE 24: HEAT SOURCE BREAKDOWN BY TEMPERATURE FOR 2021 AND 2030

Initial Assessment of Heat Demand

The heat demand was calculated using domestic building energy rating (BER) information for the dwellings for which this was available and these demands were then extrapolated to the full buildings stock based on the age and location of the dwellings for which the BER was not available. Codema created a synthetic building stock model to facilitate this and to allow future fabric upgrades to be analysed. This building stock model allows for the u-value (a measurement of heat transfer) of various elements of a dwellings envelope (walls, windows, etc.) to be adjusted and for a new heat demand to be generated based on these changes. Commercial building heat demands were calculated using the building floor areas and CIBSE [14] benchmarks. Public sector heat demands were based on metered consumption.

The map in Figure 25 shows the heat demand density in TJ/km² for each CSO[15] small area in the county. This metric is one of the key indicators for DH suitability. An interactive version of these maps is available on the Codema-dev GitHub page[16]. The breakdown of demand categorised as very feasible, feasible, not feasible, etc. can also be found on this webpage. Table 8 below provides indicative figures for DH suitability based on this heat demand density metric alone. The DH vs HP assessment in the next section of this report builds on this analysis and directly compares the two low-carbon heating options based on the cost of carbon abatement. Interestingly, the carbon abatement cost analysis shows district heating as a better option for even more of Dublin than the analysis based on demand density alone.

[14] https://www.cibse.org/
[15] Central Statistics Office - Ireland's national statistical office
[16] https://github.com/codema-dev

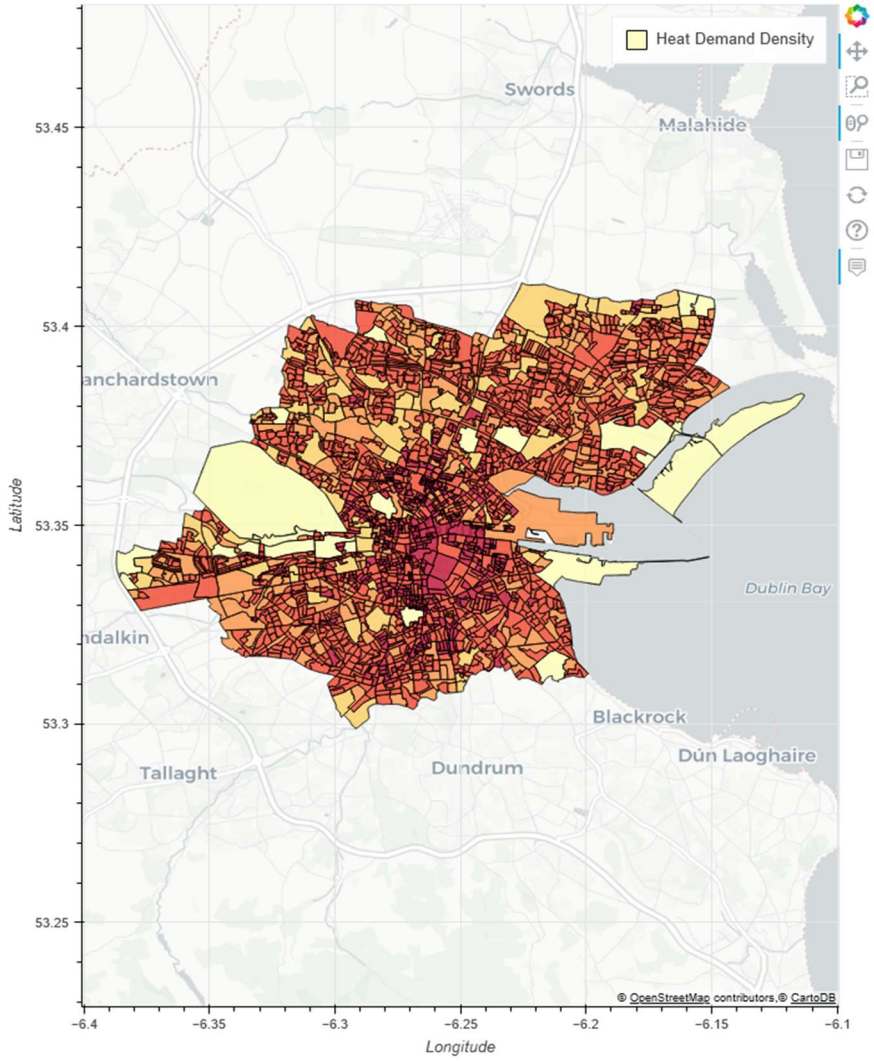

FIGURE 25: EXAMPLE OF HEAT DEMAND DENSITY MAPS PRODUCED

The table shows that 83.5% of heat demand in Dublin city is suitable for DH (above 120TJ/km^2) and that this could increase to 96.6% with supporting regulations in place.

TABLE 8: BREAKDOWN OF SUITABILITY FOR DUBLIN CITY

Feasibility	Residential [MWh/year]	Non-Residential [MWh/year]	Total [MWh/year]	Band [TJ/km²year]	% Share [MWh/year]
Not Feasible	23733	7803	31535	<20	0.7
Future Potential	89688	34996	124683	20-50	2.7
Feasible with Supporting Regulation	430562	172766	603327	50-120	13.1
Feasible	2229477	431259	2660736	120-300	57.7
Very Feasible	627162	561711	1188872	>300	25.8

Final Assessment of DH vs Heat Pumps

Two main heat decarbonisation strategies were assessed; one based on the adoption of district heating networks and the other looking at the widespread adoption of air source heat pumps. This analysis was performed for every CSO small area. The total number of CSO small areas in Dublin is 4,884. The determining factor in choosing one technology over the other was the cost of carbon abatement. The technology with the lowest carbon abatement cost (€/tCO_2 abated) was chosen as the preferred decarbonisation pathway. The cost and carbon abatement figure was calculated based on local conditions within each small area as discussed below.

District Heating Costs

The network length within each small area was determined through the use of random sampling. In this sampling exercise, indicative networks were drawn on multiple areas of a certain urban fabric. An example of the network routes drawn can be seen in the map below in red. The network length was then compared to the road centre line lengths from open street map (OSM). This relationship was then used to estimate the network length required within each small area.

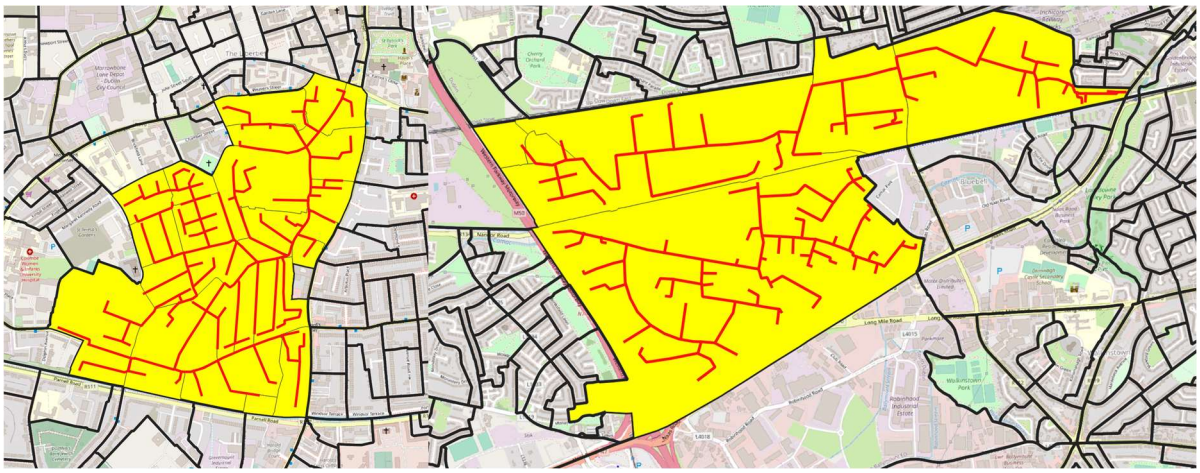

FIGURE 26: EXAMPLE OF NETWORK LENGTH ANALYSIS PERFORMED

The average DH pipe diameter rounded to the nearest standard pipe size was estimated for each small area based on the linear heat density using the following relationship[17]:

Average DH Pipe Diameter (mm) =
*(0.048*ln(Linear Heat Density in MWh per metre) + 0.063)*1000*

The capital cost of the heat production equipment was estimated based on a representative €/kW figure, which includes the capital cost of the main heating plant, backup heating plant, and auxiliary and automation equipment. The kW used to determine the cost was based on an average diversified peak heat demand for each domestic dwelling plus the diversified peak commercial demand based on the calculated annual heat demand and a typical equivalent run hours for commercial buildings.

The cost of heat interface units and heat substations were also included for the DH option based on an average kW peak demand per building.

Heat Pump Costs

The capital cost of the heat pump option was calculated using a figure of €1,200/kW thermal output. This figure assumed air source heat pumps (air to water) were fully installed including fittings, buffer tank, new cylinder (existing cylinders are not deemed compatible with efficient heat pump operation due to the relatively small surface area of their coils) and controls, but excluding the heat distribution system. Excluding the distribution system may mean the cost estimate for an efficiently-operating ASHP system may be slightly underestimated in some cases.

[17] https://hre.aau.dk/wp-content/uploads/2018/09/STRATEGO-WP2-Background-Report-6-Mapping-Potenital-for-DHC.pdf

It is understood that once heat pumps start to represent a significant proportion of the heat market, the cost of heat pumps will reduce as supply chains improve, installation overheads reduce and the equipment cost itself also reduces. This cost reduction is captured in this analysis through the annualised replacement expenditure (Repex) cost, which assumes a 20% reduction will occur[18] within the first lifecycle of the heat pumps, i.e. before 2036.

Whilst not included in this analysis, it is also worth noting that the floor area consumed by the required hot water cylinder also has a cost associated with it. For a build-to-rent apartment in Dublin, this cost is estimated at €2,350 per dwelling, for example. This cost benefit for DH was excluded as the majority of buildings in Dublin are existing buildings and already have hot water cylinders of a similar footprint installed and are designed in such a way that the floor area freed by removing these units is of limited value.

Electrical Grid Upgrade Costs for Heat Pumps

The installation of heat pumps in homes will also have an impact on the electricity grid which, in certain areas, upgrades will be required to serve these new loads. The cost of these upgrades has been estimated for the low volatge (LV) & medium voltage (MV) grid and also for the high voltage (HV) grid using two different approaches for domestic and commercial buildings.

The LV & MV grid upgrade cost adopted was based on costs from ESB Statement of Charges[19]. For existing homes whose current connection (typically 12kVA) will need to be upgraded (assumed to 16kVA) to service additional load from the heat pump (but also potentially EV charging and greater use of electric cookers). This connection upgrade charge is stated as being €1,539 for a single urban connection. This includes MV network costs but excludes trenching within the boundary of the site. Assuming a power factor of 0.95 for the heat pump load, this translates to a LV & MV upgrade cost of €405/kWe. The additional trenching cost is estimated at €6/m based on typical rates. This trenching cost would apply to all new connections but considering that Dublin consists of predominantly existing buildings and the limited impact of such a low cost, this trenching cost has been excluded from the analysis.

For commercial buildings, the impact of heat pumps on the building's maximum import capacity (MIC) was assessed in order to determine if the HP installation resulted in the building breaking its existing MIC threshold and thus incurring additional cost for falling within a higher MIC band. In the vast majority of cases, it was determined that the addition of a heat pump would not result in the building reaching the next MIC price band, but where it does the cost has been included.

[18] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/498962/150113_Delta-ee_Final_ASHP_report_DECC.pdf

[19] https://www.esbnetworks.ie/docs/default-source/publications/esb-networks-dac-statement-of-charges.pdf

Emissions from DH, Heat Pumps and Gas

The graph below shows the emissions (CO_2 and CO_2 equivalents) for the predominent existing heat supply option (gas boilers), individual heat pumps and DH networks (based on heat source mix from DH netowrks being rolled out in Dublin). These figures were combined with the cost information above to develop the cost of carbon abatement which was used to determine the preferred heating option for each small area in Dublin.

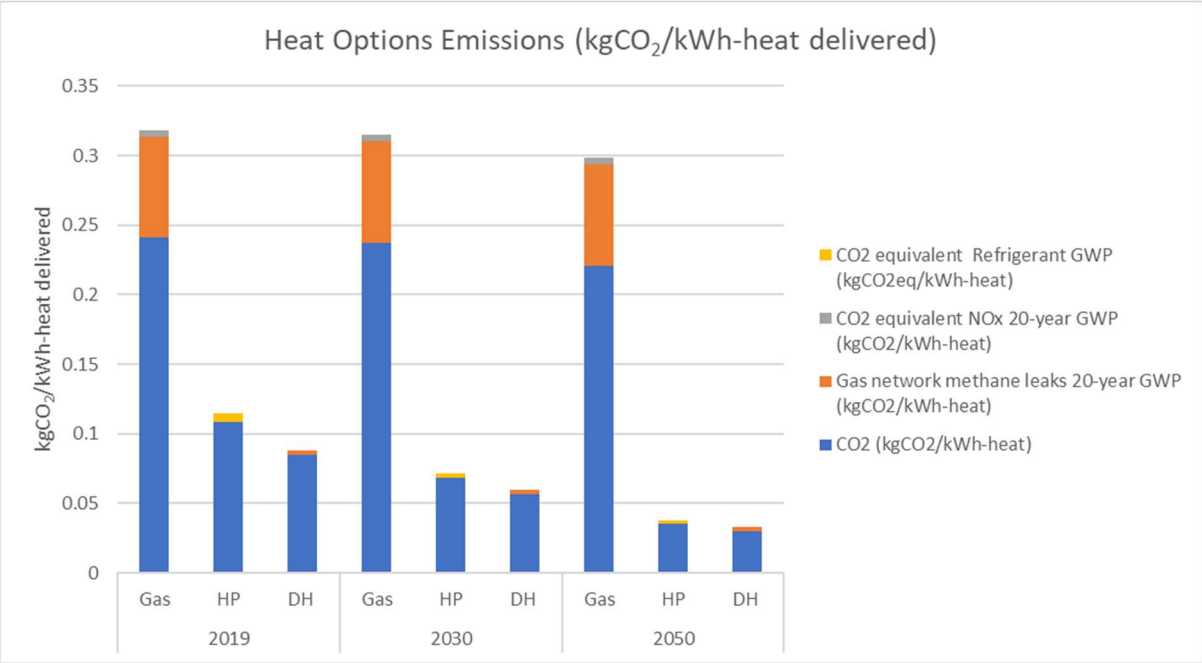

FIGURE 27: EMISSIONS (INCLUDING EQUIVALENTS) PER HEAT DELIVERED BY TECHNOLOGY

Transition Roadmap Development

The development of a transition roadmap (TR) sets out the steps towards achieving the vision from the city's H/C Plan. It is important that the TR is developed in collaboration with key local stakeholders (local working group) to ensure due consideration is given to local conditions and that the actions have the support of those who will be key to its implementation.

In the course of the Decarb City Pipes 2050 project, Dublin developed its Transition Roadmap using the following process:

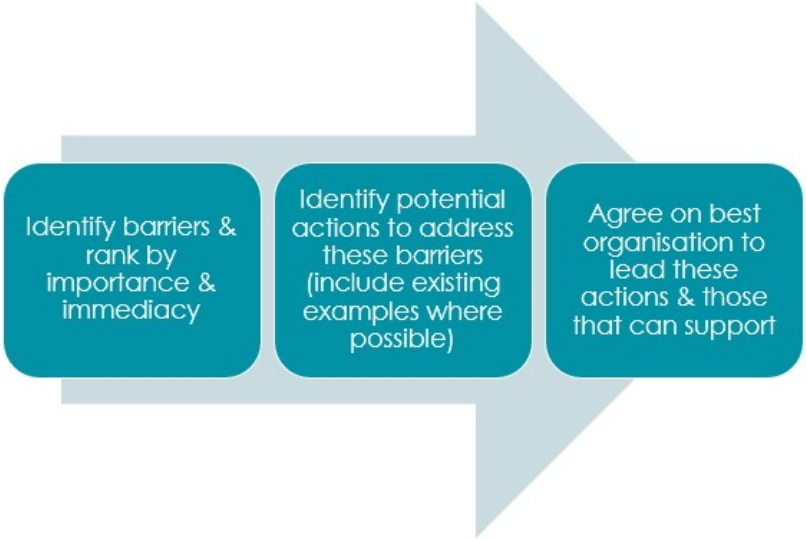

FIGURE 28: TRANSITION ROADMAP DEVELOPMENT PROCESS

The first step was to identify the barrier that would prevent each city from achieving its heat transition targets at the speed and scale required. These barriers were identified through group workshops. In order to help facilitate this process the challenges were considered under some of the headings shown in Figure 29 - political, economic, socio-cultural, techological, environmental, legal (commonly referred to as PESTEL) or under knowledge & skills, resources, regulation policy & planning, technology, mindset awareness & engagement, governance structures & authority and other.

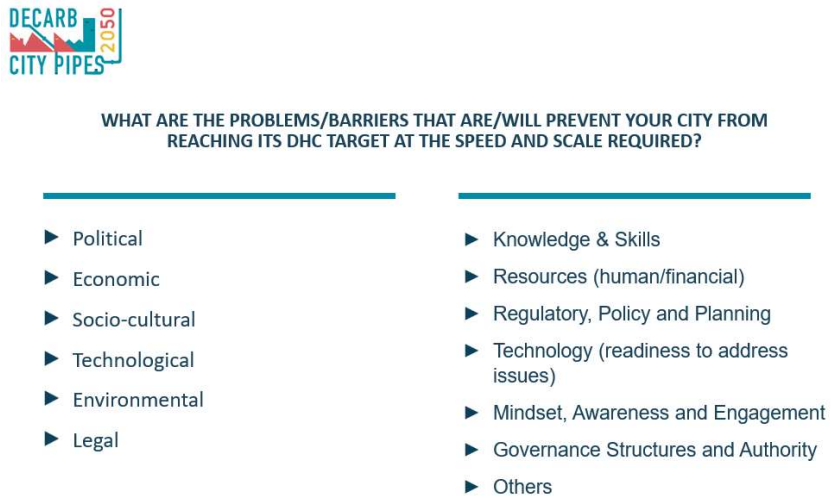

FIGURE 29: PROBLEMS AND BARRIERS THAT PREVENT ACHIEVING A CITY'S DHC TARGET

Following their identification, the barriers were placed into a hierarchy based on their priority and the timeframe in which they should be addressed. The figues below shows the matrix used for this process and some pictures from the workshops where this process was carried out.

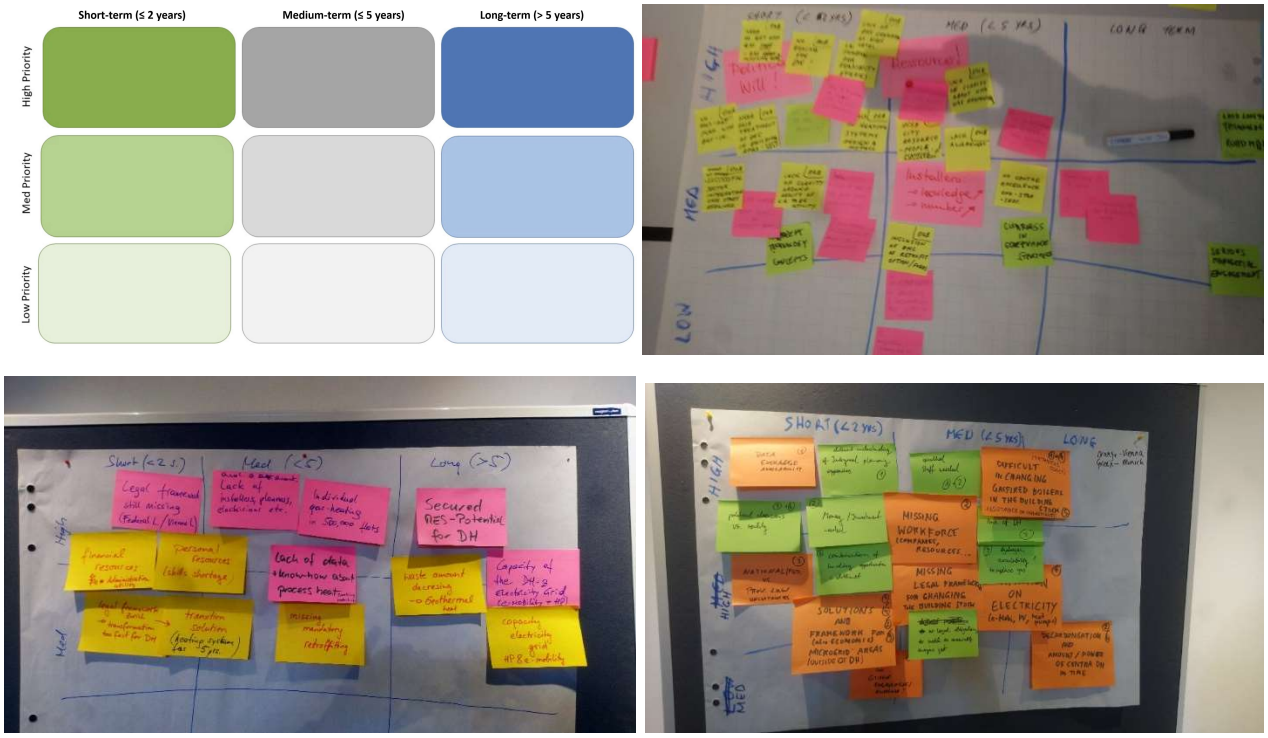

FIGURE 30: PESTEL ANALYSIS

Throughout the development, it is important to have local stakeholders involved in this process. This can often be best facilitated through online workshops using tools such as Miro. The image below shows a Miro board from such local stakeholder engagement which followed the same process as set out above.

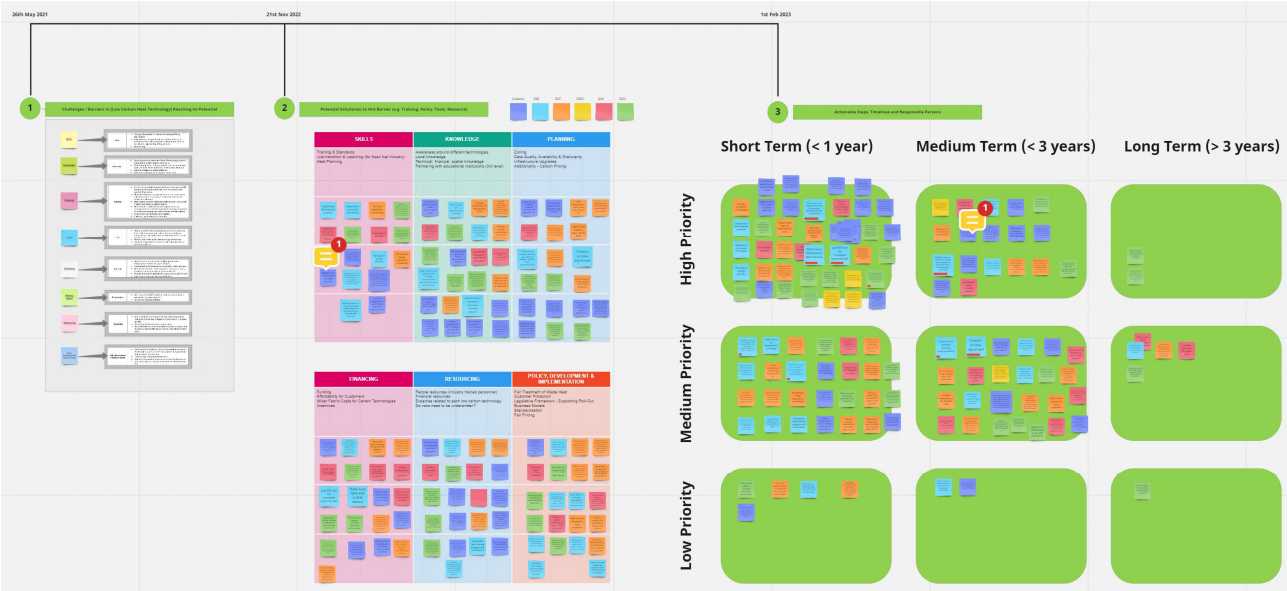

FIGURE 31: SCREENSHOT FROM LOCAL WORKING GROUP ONLINE SESSION ON BARRIER AND ACTION IDENTIFICATION

The outputs of these workshops were then used to form an action list spreadsheet. This spreadsheet lays out the actions in the format shown in Figure 32 (this is also replicated in the Transition Roadmap Actions section of this report). The main information included in this spredsheet includes:

- **Category** – the category in which the action fits (Knowledge & Skills, Resources, etc.)
- **Action** – a brief outline of the action to be taken
- **Completion Date** – Proposed date for when the action needs to be completed
- **Proposed Lead** – The organisation(s) proposed to lead the delivery of this action
- **Proposed Support** – The organisations proposed to support or provide key input into the delivery of this action
- **Supporting Information** – Resources which can be used to inform the delivery of the action e.g. international examples and case studies, further reading, additional context, etc.

Additional columns have also be added to set out indicators for successful implementation (these should be SMART – specific, measurable, achievable, relevant and timebound) or for breaking down actions in smaller, more manageable intermediate steps, these additional columns have not been included in the tables below to allow greater clarity of content. In Dublin it is envisaged that these actions would feed into the wider transition roadmap (for all sectors, not just heat) which would be managed through Dublin's Zero Together project.

Category	Action	Completion Date	Lead	Support	Supporting Information
See list on right hand side	Describe the action to be taken	Date action needs to be completed by	Organisation responsible for delivery of the action	Organisations that need to provide input	Examples/case studies, useful tools, experiments, resources, etc.

- Knowledge & Skills
- Resources (human/financial)
- Regulatory, Policy and Planning
- Technology (readiness to address issues)
- Mindset, Awareness and Engagement
- Governance Structures and Authority
- Legal
- Environmental
- Others?

FIGURE 32: OUTLINE OF THE ACTION LIST BASED ON THE PESTLE ANALYSIS

Transition Roadmap Actions

The action list developed for this transition roadmap is broken into 8 categories:

- Knowledge & skills
- Resources (human & financial)
- Regulatory, Policy & Planning
- Technology
- Mindset, Awareness & Engagement
- Governance Structures & Authority
- Legal
- Environmental

This action list is a living document that will be updated throughout its life as actions get delivered, new actions which address currently unknown barriers are added, and priorities, responsible organisations and dates are refined. It is proposed that the actions below are incorporated into the ongoing management of Dublin's energy transition through the proposed governance process being developed as part of Dublin's Zero Together project.

TABLE 9: REGULATORY, POLICY & PLANNING ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Develop a transition roadmap for the heat sector in Dublin as part of the Decarb City Pipes 2050 project - Regional strategy for decarbonising heat	2023	Codema	LWG	The final Heat Transition Roadmap for Dublin will be published in Q2 2023 and will be available on the Decarb City Pipes Website
Streamline the planning consent process for heat networks to be considered on a par with other utilities and reflects the role DH can play in tackling CO_2 emissions in the heat sector	2023	DHLGH	DHSG	Further detail on this topic and the options available can be found in the Irish District Energy Associations "District Heating Planning Guidance" report which was produced by MKO. This report is available upon request from IrDEA (email: info@districtenergy.ie)
Update Planning Act to ensure DH developers have the same powers as other utilities to lay pipework. This could potentially be achieved by expanding the definition of "statutory undertaker" to facilitate planning exemptions for this critical infrastructure.	2023	DHLGH	DHSG	Further detail on this topic and the options available can be found in the Irish District Energy Associations "District Heating Planning Guidance" report which was produced by MKO. This report is available upon request from IrDEA (email: info@districtenergy.ie)

Update Part L of the Building Regulations to ensure the fair treatment of waste heat (in line with the RED). DEAP and NEAP shall also include link to online map of existing and planned heat netowrks along with contact details of person/organisation who is responsible for network expansion to raise awareness of this heating option.	2023	DHLGH	SEAI, DECC, Codema, DLAs	Initial method developed but will require some updating over time to include additional heat sources and update intial conservative default figures (Primary Energy Factors & Carbon Factors). Barriers for DH enablement can also be considered such as the lack of data for larger heat pumps that could be used in DH-eneabled/futureproffied group heating schemes. Please see paragraph on district heating on relevant pages of the SEAI website: https://www.seai.ie/home-energy/building-energy-rating-ber/support-for-ber-assessors/technical-support/domestic-ber/space-heating/ Link to the guidance document: https://www.seai.ie/home-energy/building-energy-rating-ber/support-for-ber-assessors/technical-support/domestic-ber/space-heating/Default-district-heating-factors-for-BERs.pdf
Require energy statements to be filled out by large developments to provide information for the purpose of energy planning and to help ensure these are DH enabled. This information shall be maintained in a database	Underway	DCC Planning & DH Teams	Codema	The Dublin City Development Plan 2022 - 2028 States "In order to ensure the future development of District Heating in Dublin City, it will be necessary to ensure that significant new residential and commercial developments, particularly in SDRAs are 'district heating enabled', where feasible, in order to ensure that they are capable of being connected with local or citywide District Heating systems. Where this is not feasible, the proposed energy and heating solution should offer a similarly efficient and low carbon solution". - https://www.dublincity.ie/residential/planning/strategic-planning/dublin-city-development-plan/development-plan-2022-2028
In order for industrial sites which are being developed or expanded a report outlining the potential for waste heat should be submitted with the planning application and in the case where a network is planned/existing in the area heat recovery equipment should be installed	2023	DLA planning teams	Codema	SDCC planning requirement text which enabled waste heat use for the Tallaght Dh project can be found in Section 3.1 of the South Dublin Transition Roadmap - https://www.codema.ie/images/uploads/docs/HeatNet_NWE_Transition_Roadmap_Report_Final_-_Digital.pdf See policy recommendations from D6.3 of SoWhat project for potential further policy supports - https://sowhatproject.eu/wp-content/uploads/2022/11/D6.3-%E2%80%93-Policy-instruments-to-promote-industrial-whc-recovery.pdf

Make renewable heat projects exempt from the Multi-Unit Development Act to allow greater certainty of demand for projects in excess of 3 years	2024	DECC/ Dept of Justice/ DHLGH	IrDEA	The current limit of three years acts as a barrier to heating projects which have larger up-front capital but lower operational costs.
Ensure the role of DH in tackling CO_2 emissions in the heat sector is reflected in the National Planning Framework	2024	DHLGH	DHSG	
Legal requirement for utilities to provide fuel consumption information for their specific location (eircode or coordinates) for heat planning purposes.	2024	CRU, DECC	GNI, ESB, Oil Suppliers	Regulations in Baden-Wurtemberg require utilities (such as gas utilities) and those providing maintenance for heating systems to share their data for energy planning purposes. This law has priority over GDPR. This will enable higher quality heat planning which will be a requirement under the new EED. A similar law also exists in neighbouring province of Hessen - https://www.rv.hessenrecht.hessen.de/bshe/document/jlr-EnGHE2012V2P13 https://www.lea-hessen.de/kommunen/kommunal-waerme-planen/
Introduce more ambitious Renewable Heat Obligation (RHO) for fossil fuel suppliers and ensure DH infrastructure (using high shares of renewable or waste heat) is eligible to earn credits under any proposed RHO. This could also be a framework which Heat Purchase Agreements could use to increase investment in low-carbon heating solutions.	2023	DECC		Further thoughts from Codema on the proposed RHO can be found here - https://www.gov.ie/pdf/?file=https://assets.gov.ie/204794/50fbf420-af6f-4b9e-9a79-2c84209820ad.pdf#page=null This RHO could also act as a framework under which Virtual Heat Purchase Agreements (where a broader set of companies could pay for heat credits) could be facilitated to allow for greater private financing of low-carbon heat solutions.

Assign areas for district heating and cooling (based on viability mapping e.g. from H/C Plan and stakeholder engagement) where large public buildings would be required to connect to DH and other buildings would need to provide proof of why it might not be viable to connect ot DHC as their low-carbon heat supply - Futureproof for connection, link to availability of grants for different technologies to ensure cost parity for customers.	2024	DECC	Codema, DCC, SEAI, IrDEA	Codema's research comparing DH zoning approaches in Scotland, England and Denmark is available upon request and is due to be published on the Codema website in 2023 Dublin City Council have also introduced similar elements in the latest City Development Plan which requires developments of 30 dwellings or 1,000m2 of commercial floor space to produce and energy statement and future-proof for DH connections where feasible. Can also take learnings from the implementation of the UKs 28 DH zoning pilot areas.
Ensure areas identified as suitable for DH (through the energy planning process) are highlighted and supported in Local Development Plans in accordance with regional policy objectives set out in the regional policy objectives from the EMRA	Underway	DLAs	Codema, OPR, EMRA	National and regional suitability maps already exist such as the Codema DH viability and heat source maps https://codema-dev.github.io/posts/, the IrDEA Heat Atlas https://districtenergy.ie/heat-atlas/ , and the SEAI DH candidate area map https://gis.seai.ie/districtheating/
Initiate a DH zoning pilot in the Dublin area to learn by doing. Can also take learnings from 28 UK pilot zoning schemes.	Underway	DCC	Codema	As part of the Decarb City Pipes project a policy experiment on zoning for DH was considered. Some of the learnings from this process are now incorporated in the City Development where new larger developments across the city are required to consider DH as a heating solution and future proof for DH where this is feasible.
Develop a national stance on green hydrogen that outlines this should only be used for hard-to-abate uses where lower cost low-carbon alternatives do not already exist such as use a feedstock for industry, aviation etc.	2023	DECC		Green Hydrogen should be used for high-exergy applications or as a feed stock for industry where other sustainable alternatives do not exist. Therefore, it is not foreseen that green hydrogen will play a role in the provision of space heating or hot water preparation. Further thoughts on this can be found in Codema submission to Ireland Hydrogen Strategy Consultation - https://www.codema.ie/images/uploads/docs/Codema_Submission_on_Hydrogen_Strategy_Consultation.pdf

Lower taxes on electricity used for supplying low-carbon renewable and waste heat	2024	DECC		The large differential between electricity and gas prices can be an impediment to the adoption of technologies such as heat pumps. Information on the current "Spark Gap", in countries across Europe can be found in Section 3.3 this report by the IEA HPT TCP Annex 48 - https://heatpumpingtechnologies.org/publications/final-report-annex-48-industrial-heat-pumps-second-phase/ Fairer levies on electricity can help reduce this gap and make heat pump more cost competitive. This report by the Regulatory Assistance Project "Levelling the Playing Field " report https://www.raponline.org/wp-content/uploads/2022/07/Taxes-and-levies-final-2022-july-18.pdf
Review level of consensus and legal requirements to allow buildings with multiple privately-owned dwellings to deliver whole-building heat solutions or connect to DH networks	2024	DECC/Dept of Justice/ DHLGH		In some European countries, only a majority (more than 50%) consensus of tenants is required to adopt a new whole-building heat solution and in others this % is much higher. Need to better understand the thresholds required in Ireland and review if these are found to be prohibitively high thresholds.
Review the heat loss threshold required to secure grants for heat pumps - look at potential for increasing the allowable heat loss index to allow more homes to be eligible for support but without exceeding limits that would result in poor heat pump performance. It should also be allowed that measured heat loss figures from a heat loss survey of the building be used to prove the buildings heat loss for grant eligibility purposes.	2024	SEAI		Further study needs to be done on determining a suitable heat loss indicator for heat pump adoption. This refined HLI threshold should also be related to the type of emitters used in the building and the associated flow temperature in these emitters. DEAP is not a robust means of calculating real world heat loss. This is due to a number of factors, such as models not capturing the as-built details of the building due to data gaps (undocumented changes to the building etc.). Having a grant system that is based on this logic is similarly not robust and could lead to unnecessary and expensive retrofitting works being carried without a real need. To this end, real world measurement of heat loss should be an acceptable alternative to the HLI calculated through the DEAP software. This type of heat loss measurement is carried out by companies such Veritherm https://veritherm.co.uk/testing/

Ensure customers are protected. Particularly ensure that residential customer currently on gas-based communal schemes are not subject to commercial gas price increases as these systems are often confused with Efficient DH networks	2023	CRU	EPA on licencing?	The Heat Trust (https://www.heattrust.org/the-scheme) is a voluntary regulatory standard for DH in the UK and is not being subsumed into Ofgem (the utility regulator in the UK) the learning from this process could inform similar development of the heat network regulatory process in Ireland. The regulator may also act as the licencing agency for developing and operating heat networks in the country.
Require local authorities which have 45,000 inhabitant or more to produce heat plans in line with the latest EU Energy Efficiency Directive.	2024	DECC		Final threshold is to be determined as part of the EU trialogue by end of Q2 2030 and is likely to be between 35,000 and 50,000. IN either case this would make heat planning a requirement for at least 30 of the 31 local authorities in the country (Leitrim being to only exception).
Phase-down plan for gas networks which are currently used to provide space heating and hot water. This shall include specific closure deadlines for fossil fuel infrastructure for specific geographical locations e.g. gas boilers will be banned in 5 years and gas network will be turned off 10 years after DH starts to be developed in a given zone.	2024	GNI	CRU, DECC	Winterthur law example where a shut of date for gas to flow through the gas network has been set for 2032 and gas boilers have been banned as of 2020 - https://www.zh.ch/de/politik-staat/gesetze-beschluesse/gesetzessammlung/zhlex-ls/erlass-730_1-1983_06_19-1986_07_01-118.html?search=energiegesetz ACER report on Future Regulation of Natural Gas Networks https://www.acer.europa.eu/sites/default/files/documents/Media/News/Documents/Future%20Regulation%20of%20Natural%20Gas%20Networks%20-%20Final%20Report%20DNV.pdf The Future of Gas (EASAC) https://easac.eu/fileadmin/user_upload/EASAC_Future_of_Gas_Web.pdf
Ensure that remaining gas customers are protected from gas network capacity charge increases when the gas infrastructure is being phased down until they get to transition to low carbon technologies.	2026	CRU	GNI, DECC	Gas phase down should be coordinated with the introduction of alternative heating technologies. This could be one of the roles of the Integrated Heat Planning Team discussed under the "Governance Structures and Authority" actions.

TABLE 10: RESOURCES ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Establish a dedicated fund at the required scale for the delivery of DH networks.	2023	DECC/ DH Programme Office	DPER, NTMA, Delivery Unit	The long-term source of funding for this could come from carbon tax funds, the proposed renewable obligation, or other sources. Aside from delivering networks this will also provide a market signal to attract private sector involvement and spark investment in training. Current funding methods such as the CAF have limits which can curtail the development of larger networks.
Resource a DH delivery unit to support the roll out of DH networks - support (technical, financial, legal) to local authorities, community groups or other organisations looking to develop networks	2023	DECC	SEAI, Codema	
Provide resources to allow public sector organisations (LAs, CRU, DECC, etc.) to hire dedicated full-time staff to facilitate the roll-out of DH (e.g. heat planners, project coordinators, regulator, licencing, etc.)	Ongoing	DECC/ Delivery Unit	Relevant public sector organisations	It is important that these staff members have heat decarbonisation as a key element of their role and that this is supported at all levels of management. The report developed by Energy Cities on the Human Capacity in Local Governments: The Bottleneck of the Transition provides indicative numbers for Local Authorities as well as innovative ideas on how to attract talent and foster peer-to-peer learning between Local Authorities https://energy-cities.eu/wp-content/uploads/2022/05/EnergyCities21_PolicyPaper_CapacityNeeds_EN_FINAL-2.pdf
Produce a private investor pack for DH to provide background information on the investment opportunity for Dh in Dublin -	2024	Codema	DH Investors	This short document could include information on supporting policy and targets, example returns, source of other part-funding, risk & mitigation. The findings from the Dublin H/C Plan can help inform this piece of work. The UK Heat Networks Overview brochure provides a good example of a clear and engaging format for such a document https://heatnetwork.zone/documents/BEIS_Heat%20Networks_The_UK%20market.pdf

Develop a national level insurance scheme to underwrite some of the risks associated with waste heat use which are not naturally the responsibility of the waste heat owner or the DH company.	2024	DECC	DPER	An example of such a situation would be if waste heat owner goes out of business. This may be too big a burden for smaller DH companies to shoulder and therefore be a barrier to development of a project. Similar schemes exist in relation to de-risking drilling geothermal projects in the Netherlands. - https://www.rvo.nl/sites/default/files/2020/04/Handleiding-risicos-dekken-voor-aardwarmte-2020.pdf
Ensure that building owners are supported through grants to install heat substations in their building in the same way that heat pumps are supported.	2024	SEAI		

TABLE 11: KNOWLEDGE & SKILLS ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Engage with educational institutions and existing private sector organisations (ESCo, consultancies, etc.) to deliver training and certification to build indigenous capacity to deliver the heat networks required in areas such as DH pipe installation, heat pump system design, etc.	Ongoing	Codema	SEAI, Engineers Ireland, 3rd Level Institutions, ETB, FETAC, HETAC, DFHERIS, QQI	Engagement with local Education and Training Boards, Manufacturers, Technical Universities, and Professional bodies such as Engineers Ireland has already begun to help deliver local skilled workers to facilitate the roll out of DH. Further engagement is required to deliver formal training in areas where skills are currently lacking. The skills gaps for DH in Ireland are expected to be similar to those in other countries where DH currently has a lower market penetration like the UK. The following documents outline some of these skill shortages. Heat Networks Skills Analysis for Scotland - https://energysavingtrust.org.uk/wp-content/uploads/2020/10/Heat-Network-Skills-Analysis-for-Scotland.pdf Energy Savings Trust Skills Initiative Report - https://energysavingtrust.org.uk/wp-content/uploads/2020/10/Heat-Network-Skills-Initiative-PDF-1.pdf BEIS Heat Network Skills Review 2020 - https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/919521/heat-network-skills-review.pdf Initial steps have been taken by Codema to introduce the area of DH

				to relevant bodies with the development of the "Fundamental of District Heating" course which Codema delivers on behalf of Engineers Ireland which draws on the experience of Codema in developing heat networks in Ireland - https://www.engineersireland.ie/Events/event/7887
Develop an online platform where highly skilled designers and installers can share their knowledge and provide ongoing support for those encountering challenges on the ground as they arise	2025	DH Delivery Unit	IrDEA	This can provide additional support when real world situations are encountered that cannot easily be accounted for in more formal training courses.
Raise awareness and provide additional training for those workers with complimentary skills currently working in the fossil fuel industry or other related industries such as facility management & ESCo's to enable them to work on the development, operation and maintenance of DH networks.	2024	DH Delivery Unit	Codema, IrDEA, SEAI	
Provide financing to small businesses looking to upskill workers to install less familiar low-carbon installations (heat pumps, DH pipework & substations, lower temp secondary heating systems and controls). This would allow workers to upskill without significant drop off in earnings and without putting the financial burden of attending the training and the initial lower productivity on the small business owner when learning a new skillset. This is important in a highly competitive labour market. Alternatively, this could be delivered by means of a tax credit for workers who are upskilling.	2024	DH Programme Office/DECC/DPER/DFHERIS/SEAI/DH Delivery Unit		This would look to soften to impact of potentially lower earning potential when someone transitions to a new sector and initially has a period of lower productivity due to being less familiar.

Hold heat planning workshops to upskill planners, etc. in the area of heat planning to ensure high level of quality for such plans for each LA area - Share tolls re heat sources available etc.	Ongoing	Codema	DLAs	Codema heat & energy planning workshops and other European workshops such as Hotmaps, Act!on Heat etc. This will become more important as the requirement for Municipalities (of greater than 45,000 inhabitants) to carry out heat planning under the proposed EU Energy Efficiency Directive. This would cover all but one municipality in Ireland.
Develop a guide for developing feasibility studies for DH projects including supporting tools and templates in order to develop a pipeline to investment decision stage. This will include standardised installation cost information, carbon pricing, etc.	2023	Codema /SEAI	Relevant Stakeholder groups	Codema are currently deploying this guidance on behalf of SEAI and in conjunction with key stakeholder groups - further information on this can be found by contacting Codema or visiting the project page on the Codema projects page - https://www.codema.ie/projects
Wider dissemination of key design principles and highlight standardised efficient designs for M&E installation in buildings (DH connections, heat pumps, etc.)	2024	IrDEA/ Codema		The overarching design principles are currently discussed in the Fundamentals of District Heating course - https://www.engineersireland.ie/Events/event/7887 (currently delivered by Codema on behalf of Engineers Ireland and with discussions to deliver similar content in conjunction with local ETBs) and in CIBSE CP1 Training course. https://www.cibse.org/training/search-courses/heat-networks-code-of-practice-cp1-full-course Other useful guidance include the BEIS Het Network optimisation videos (covers topics such as managing water flows, water quality, flow and return temperatures, complexity, insulation and plant room efficiency) https://www.gov.uk/government/publications/heat-networks-optimisation-guidance-to-help-operators-improve-performance/heat-network-optimisation-guidance-videos , Bristol & Plymouth Guides for Technical Designers of Heat Network connections https://www.plymouth.gov.uk/sites/default/files/ConnectingToThePlymouthHeatNetworkPart2.pdf. Tools like Hysopt can also be used to optimise hydronic system designs and controls for specific systems.
Networks that are being developed should be contractually obliged to make time (a defined	2023	DH Delivery Unit	IrDEA	

number days) available to local tradespeople etc. to learn by seeing in order to help build local capacity for delivering networks and help those transitioning to gain familiarity with DH procedures				
A minimum requirement in terms of local workers should be considered to stimulate the local supply chain and create local wealth where possible.	2026			
Incentivise contractors from the EU to come to Ireland to share knowledge. This can be supported through the development of ambitious targets & Investor/contractor information sharing and engaging with Embassies or directly with multinational companies.	2023	DECC/ IrDEA	Euroheat & Power, IDA, Embassies, International ESCo's & contractors	
Use output led approach to the procurement of DH projects in order to leverage knowledge and experience from external organisations	Ongoing	DH Developers	Codema	This approach was used for the Tallaght DH network and can help engage/leverage international experience to a greater degree. Further details on this approach are available from Codema (email: codema@codema.ie)
Support new DH regulator by supplying specialist DH knowledge and experience to ensure safe, affordable and reliable heat supply.	Ongoing	District heating steering group/ IrDEA		This is key to ensuring high quality of service and building confidence with potential heat customers
Government grant to be made available for those looking to complete registered courses relevant to building capacity in the DH sector	2024	DFHERIS	DPER	UK example - Training providers: register to offer the Heat Training Grant for heat networks - https://www.gov.uk/government/publications/training-providers-how-to-offer-the-heat-training-grant-for-heat-networks
Ensure best practice examples or projects and approaches from around Europe are shared with Irish stakeholders through sharing reports and holding knowledge sharing sessions - Decarb, Celsius, DBDH, EH&P, IEA TCP, etc.	Ongoing	Codema /SEAI/ DH Delivery Unit	DH Developers	An example of this is the HeatNet NWE project which looked to promote the development of 4th Generation DH in 6 countries across north-west Europe. The resources developed as part of this project can be found on the following online platform - https://guidetodistrictheating.eu/ Other useful platforms include the Celsius Toolbox

				https://celsiuscity.eu/category/toolbox/

TABLE 12: TECHNOLOGY-SPECIFIC ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Heat recovery equipment for the capture of waste heat to be eligible for support under the SSRH or similar support scheme such as CAF	2023	SEAI, DECC		
Consider inclusion of the recommendations outlined in the "From Data Centres to District Heating & Cooling: Boosting waste heat recovery to support decarbonisation" paper at a national level	2023	DECC	Codema/ EH&P	A link to this paper produced by Euroheat & Power with input from Codema and other representatives from both the DH and data centre industries is available here https://www.codema.ie/media/news/codema-supports-new-recommendation-paper-from-data-centres-to-district-heat
Support the development of deep geothermal heat source to provide indigenous, renewable and secure heat supply for DH and industrial applications. This can be done through provision of funding for exploration/research (e.g. seismic surveys & exploratory boreholes) to better quantify the resource and ensure this information is available for DH project development.	2023	DECC/ GSI/DPER	Codema/ SEAI	

TABLE 13: MINDSET, AWARENESS & ENGAGEMENT ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Effectively communicate the details of how to apply for funding under the proposed heat network fund described above.	2023	DECC/ DH delivery unit	IrDEA members	

Develop material to highlight pathways for those currently working to fossil fuel industry (many of whom have complimentary skills - pipe installs, metering & billing, asset management, etc.) to transition into DH	2024	Codema	GNI, GSI, etc.	Those who work in the fossil fuel industry may have concerns about the future of their industry and the impact it is having on emissions and the resulting climate change. These people possess many transferrable skills that can be utilised to build capacity within the low-carbon sector. However, pathways for transitioning people from the fossil fuel to the green sector are not well known or communicated.
Raise awareness of Thermal Energy Storage for providing services to the electricity grid in the form of grid balancing/demand flexibility, frequency response, etc.	2024	Codema	Energy Storage Ireland, ESB, Eirgrid, CRU, NNLC	Codema electricity storage consultation submission (Jan 2023) - https://www.codema.ie/images/uploads/docs/Codema_Submission_on_Developing_an_Electricity_Storage_Policy_Framework_for_Ireland_-_Final.pdf Further study has also been carried out by Codema into the potential contribution of thermal storage to delivering a more resilient Irish energy system as part of the Poolbeg RDD Project. This study focused on curtailment mitigation of renewable electricity generators such as offshore wind and found that thermal storage can provide energy storage at approx. 1% of the cost of battery storage and requiring less than 10% of the land. Further details on this project can be found here - https://www.codema.ie/projects/local-projects/integration-of-heat-electricity-and-transport-use-of-curtailed-renewable-en EU Commission Recommendation Paper on Energy Storage states that "in particular large thermal storage in district heating systems, can provide flexibility and balancing services to the electricity grid and therefore provides a cost-saving system integration solution by absorbing variable renewable electricity production (e.g. wind and solar energy)". - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023H0320(01)

Early engagement with the public to raise awareness of heat networks - will help avoid misinformation, highlight the comparative benefits of DH, liaise with waste heat owners (industrial sites etc.) - share case studies, publish prices with a comparison with alternatives, host tours of DH networks, facilitate sessions with other regions in Europe to share knowledge	2023	DECC	IrDEA, SEAI, Codema	Ongoing engagement in European project and forums is hugely important for knowledge sharing. The Decarb City Pipes project itself is a great example of this. This also helps promote best practice as outlined in the "Knowledge & Skills" actions.
Conduct a citizen engagement survey in relation to district heating. This will help gauge likely connection rates and key concerns of potential customers to ensure these are addressed.	2023	ESRI/ Codema /SEAI		See example from Communication Works "Winning the Hearts and Minds" report - https://communicationworks.eu/eng/wp-content/uploads/sites/2/2017/08/UK_District_Heating_Communication_Works_2017-1.pdf
Maintain an online map of both existing and planned heat networks including contact details of person/organisation responsible for each network's expansion (a link to this information should be provided in any DEAP or NEAP software)	2024	Codema		Cities like London already have a map of both planned and existing heat networks along with heat sources https://maps.london.gov.uk/heatmap Dublin has heat source https://codema-dev.github.io/map/heat-source-map/ and DH viability maps https://codema-dev.github.io/map/district-heating-viability-map-v2/ but as networks are rolled out it is important that the existing and proposed networks are also mapped so potential customers/stakeholders can see if they have a network nearby
Investigate the potential for certifying sites as a waste heat supplier to support corporate social responsibility objectives or comply with waste heat utilisation policy. Site provide data on waste resource and make their heat available for DH when developed.	2024	DH Delivery Unit / DECC	Local Authorities	Such a certification scheme could be a waste heat version of something like Origin Green (used in the food industry). As part of this WH owners would provide data to help characterise their resource and sign a MoU to make this heat available if a DH network were to be developed in the area. This scheme could also act as eligibility criteria for LAs to reduce rates for companies which sign up to this initiative. As part of the EED Data Centres of 100kW or more will be required (March 2024) to publish the proportion of their waste heat being utilised. Could this be expanded to other waste heat owners such as waste water treatment plants etc.

Develop tool to identify likely suitable business model for DLAs and other organisation who may be interested in developing DH networks	2023	Codema	DLAs	A methodology for assessing this is being explored as part of the District Heating Feasibility Study Guide being developed by Codema on behalf of SEAI
Develop a best practice guide for customer service in heat networks including minimum customer protection standards.	2025	CRU	DH Companies, Other utilities	This could include discussion on items like: Complaints department structuring (assigned rep who contacts the various depts on behalf of customer rather than customer being kept on hold), rewards & incentives for desirable customer behaviour and/or engagement, etc.
DH networks that are developed should host regular tours of their installations to act as demo sites for customers, policy makers etc. to have real life sites to visit	2023	DH developers	DH Programme Office, Dh Delivery Unit, Codema, HeatWorks, IrDEA, SEAI	Rewards & incentives for good customer behaviour e.g. sets up direct debit, turns down thermostat (could gamify against neighbours)
Engage with Sustainable Energy Communities and local business organisations to raise awareness about DH potential in their area & how to progress potential community projects	2023	Codema	SEAI, LA	Directly asking customer what they would like to see e.g. various future heat source options - pay more for certain tech but might have more price security etc.
Publish heat prices publicly with comparisons to alternative heating solutions to help with potential misunderstandings on the difference between heat price and fuel price.	2024	CRU	DH developers	Heat Trust comparison tool https://www.heattrust.org/heat-cost-comparator Published Danish heat prices - https://forsyningstilsynet.dk/tal-fakta/priser/varmepriser The Tallaght DH network will also be publicly publishing its heat price to improve transparency, engagement and trust. These prices will be published in the HeatWorks website https://heatworks.ie/
For rental properties where split incentives between landlords and tenants are an issue. Rental prices inclusive of estimated heating costs from the building BER/EPC should be required to be published when advertising the premises for rent.	2024	DHLGH	SEAI	SEAI behavioural insights unit report on behavioural barriers to retrofitting - https://www.seai.ie/news-and-media/behavioural-barriers-to-r/

Map and facilitate stakeholder (supply and demand side) engagement and particularly engagement with local authorities to test approaches, gather feedback and refine outputs at a more local level.	Ongoing	Codema, Delivery Unit		GIS maps produced for Tallaght and Blanchardstown. Certain data available from Codema upon request.

TABLE 14: GOVERNANCE STRUCTURES & AUTHORITY ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Set up a national delivery unit which will be responsible for providing technical and financial support to those looking to develop networks and ensure high standards of design, installation, feasibility etc.	2023	DECC		Thoughts on what such a unit could look like including key roles and responsibilities are available from Codema & SEAI
Create an integrated heat planning team for the heat transition including all relevant utilities (gas, electric, DH).	2023	Codema	Decarb City Pipes LWG	This will also help with ensuring roll-out of low-carbon heating and the phase down of fossil fuel infrastructure is aligned i.e. low-carbon commissioned before FF supply is turned off. This should also help with the flow of data and knowledge and help avoid each utility thinking in their own silo and potentially missing integration opportunities and cost-efficient solutions that come from holistic planning. This may also allow the process of securing an electricity grid connection for heat pumps and electrode boilers to be more streamlined which is currently one of the biggest risks for delays. This could be a potential ongoing role for the LWG (perhaps in conjunction with the Zero Together team. Trench sharing and coordination of installation works can also be optimised as part of an expanded group which could include highways teams, broadband installers etc. as well as the ability to make strategic decisions on technology pathways such as biomethane or the role (if any) for existing gas network infrastructure. An effective structure is already in place in cities like Vienna. Greater detail on this structure is available from Codema.

Need to implement a system of measurement and verification to track targets and contribution to CO_2 emission reductions.	2024	DH Delivery Unit	DH developers	Where the ongoing operation of the network is being carried out by private ESCo's this sharing of data should be included as a requirement at contract/procurement stage

TABLE 15: LEGAL & ENVIRONMENTAL ACTIONS

Action	Completion Date	Lead	Support	Supporting Information
Develop template contracts to reduce the legal burden of developing contracts for DH projects from scratch	Ongoing	Codema	SEAI, Philip Lee	An Irish DH contract template has been developed by Philip Lee solicitors in conjunction with Codema and SDCC based on the contracts developed as part of the Tallaght DH network Examples from other jurisdictions include the SOMS templates (UK) https://tp-heatnetworks.org/heat-contract-templates/ Examples from the R-ACES project https://r-aces.eu/tools/legal-decision-support-tool/
Provide guidance on developing contracts for DH networks need to include important performance criteria such as the carbon content of the heat produced and the level of service provided to customers (e.g. limit the number and duration of outages)	2024	DH Delivery Unit	CRU	
Develop mechanisms through which 3rd parties can provide renewable or waste heat to the DH networks	2027	DH Delivery Unit	CRU	
Consider the potential to take advantage of economies of scale by performing an Environmental Assessment and Appropriate Assessment for all areas identified as suitable for DH if required	2024	DHLGH, EPA	SEAI	

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