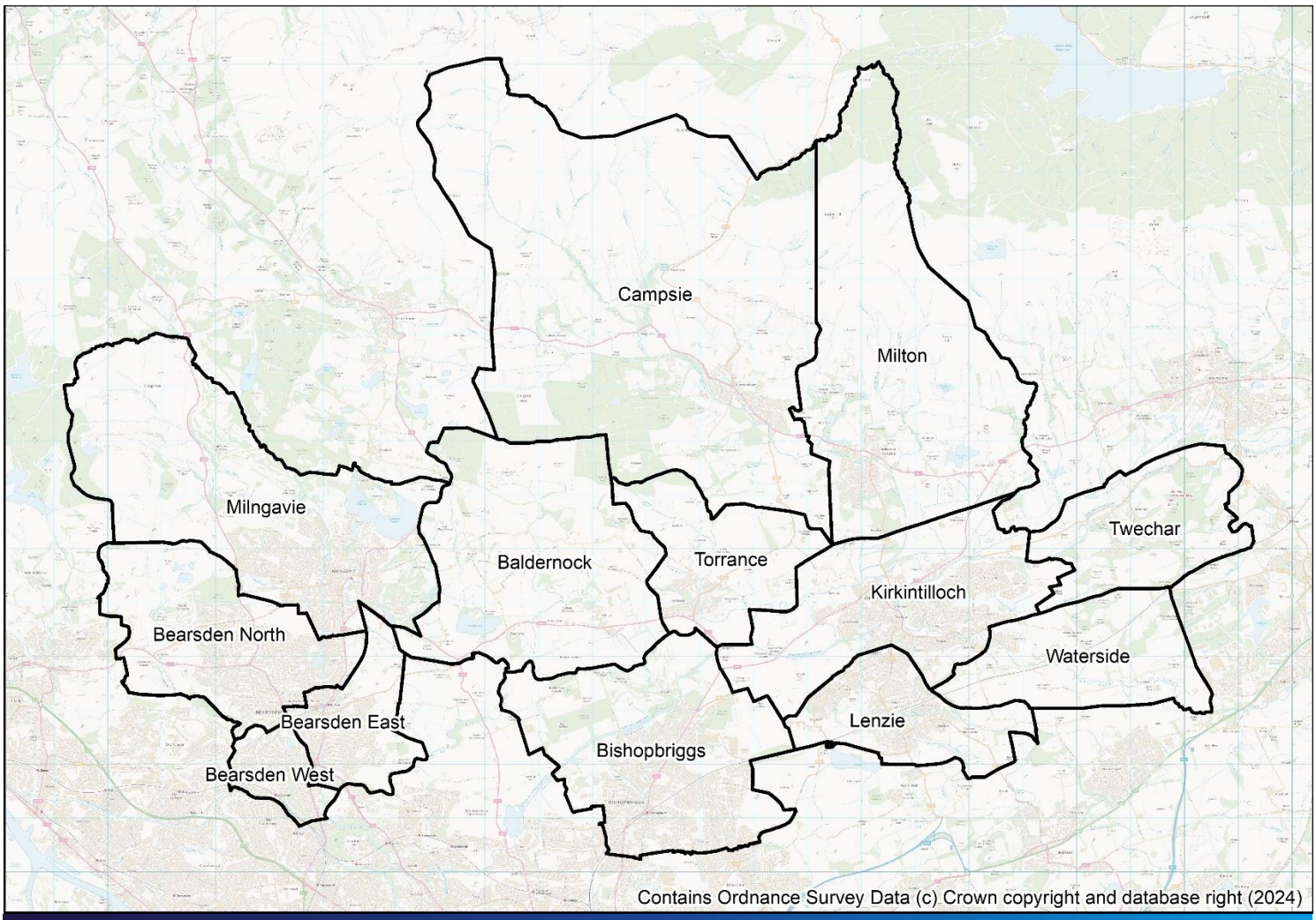

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Local Heat and Energy Efficiency Strategy

Report for: East Dunbartonshire Council

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1	Draft for Council input	JG, BK, AC	19/06/2024
2	Revised Draft following Council comments	JG, BK, DM	28/06/2024
3	Revised Draft	DM	02/07/2024
4	Revised Draft	BK, DM	11/07/2024
5	Revised following comments from LHEES working group & external stakeholders	DM, SR, BK	31/07/2024
6	Minor updates to figures & tables in appendices	SR	02/08/2024
7	Ricardo review of Council edits	SR	15/08/2024
8	Addition of green space to evidence report	SR	20/08/2024
9	Addition of green space map for Bearsden	SR	20/08/2024
10	Minor edits throughout Strategy	SR	20/08/2024

11	Addressing further comments	SR	21/08/2024
12	Figure 6 updated	SR	23/08/2024

Contents

1. Executive Summary

East Dunbartonshire's Local Heat and Energy Efficiency Strategy (LHEES) presents the results of a detailed baseline analysis of the Council area's domestic and non-domestic properties while setting out how each segment of the building stock needs to change to meet national and local objectives, including achieving zero greenhouse gas emissions and removing poor energy efficiency as a driver of fuel poverty.

The LHEES includes the identification of strategic heat decarbonisation zones and the principal opportunities for reducing emissions from buildings in each zone. These strategic zones were based upon East Dunbartonshire's Community Council areas as they offered clearly defined boundaries while providing a level of granularity that supported the production of useful outputs.

The LHEES also identifies geographical delivery areas where there is highest potential to reduce fuel poverty through prioritised energy efficiency interventions (see Figure 42). The priority delivery areas were developed using multi-consideration approach including the following:

- lower SIMD scores;
- energy efficiency weighted score;
- data zones with properties that would benefit from loft, window or wall insulation measures;
- data zones with high numbers of EDC properties to support implementation projects that EDC can have the maximum influence on.

Key points that stemmed from East Dunbartonshire's LHEES analysis include the following:

- of the 48,501 domestic properties in East Dunbartonshire, 27,272 are likely to be suitable for heat pumps retrofits today rising to 43,224 properties with basic fabric improvements applied.
- Heat pumps are the technology likely to have the biggest impact in decarbonising heat.
- Fuel poverty rates in East Dunbartonshire are lower than the Scottish average.
- The LHEES analysis identified a potential heat network zone in Kirkintilloch Town Centre and recommends that further feasibility work be carried out to establish its potential viability and scope for designation of a Heat Network Zone there in terms of the Heat Networks (Scotland) Act.
- The Consultants identified a number of small clusters of buildings where there may be potential to identify a heat network between, particularly Council owned buildings, such as around Bearsden Academy.

The LHEES is accompanied by a Delivery Plan which has been developed in partnership with key stakeholders and provides a set of actions for local communities, government, investors, developers and wider stakeholders, pinpointing areas for targeted intervention and early measures. While there is a need to support decarbonisation of the whole building stock in the East Dunbartonshire area to meet the Scottish and Council area-wide net zero targets, the LHEES takes a pragmatic approach focusing on what can be realistically delivered in the foreseeable future based upon limits to the amount of funding available.

2. Abbreviations

Table 1: Abbreviations

Acronym	Description
BAR	Building Assessment Report
COP	Coefficient of Performance
EDC	East Dunbartonshire Council
EES	Energy Efficient Scotland
EESSH	Energy Efficiency Standard for Social Housing
EPC	Energy Performance Certificate
ESCCS	Environmental Sustainability & Climate Change Strategy
EST	Energy Saving Trust
GHG	Greenhouse gas
GIS	Geographic Information System
HIBS	Heat in Buildings Strategy
EES: ABS	Energy Efficient Scotland: Area Base Schemes
LHEES	Local Heat and Energy Efficiency Strategy
LPG	Liquefied Petroleum Gas
Mxd	Map Exchange Document
PEAT	Portfolio Energy Analysis Tool
SAP	Standard Assessment Procedure
SIMD	Social Impact of Multiple Deprivation
RSL	Registered Social Landlord
UPRN	Unique Property Reference Number

3. Introduction

3.1 Overview of LHEES

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022[1] places a duty on local authorities to prepare and update a Local Heat and Energy Efficiency Strategy (LHEES) and Delivery Plan. The aim is to set out the long-term plan for decarbonising heat in buildings and improving their energy efficiency across an entire Local Authority area in order to support Scotland's statutory targets for greenhouse gas emissions reduction and fuel poverty. The Scottish Government Local Heat and Energy Efficiency Strategies (LHEES) and Delivery Plans: Guidance[2] provides a structured approach for delivering the statutory requirements placed by the 2022 LHEES (Scotland) Order. While the approach takes a building-level analysis to develop opportunities within delivery areas, the strategy links with Heat Networks (Scotland) Act to develop potential delivery areas for heat networks within each Local Authority area. Therefore, the LHEES will have dual benefits of mitigation and adaptation as buildings and all other estates assets will need to future-proof and address their energy efficiency and wider resiliency.

This document is prepared by East Dunbartonshire Council (EDC) to fulfil its duty under this order, setting out how each segment of the building stock needs to change to meet national and local objectives to reduce carbon emissions in addition to the removal of poor energy efficiency as a driver of fuel poverty across East Dunbartonshire.

According to 'The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019', a household is considered to be in,

Fuel Poverty -
if "after housing costs, the total fuel costs needed to maintain a satisfactory heating regime are more than 10 of the household's adjusted net income and if, after deducting fuel costs, housing costs, benefits received for a care need or disability, and childcare costs, the household's remaining adjusted net income is insufficient to maintain an acceptable standard of living"; and in

Extreme Fuel Poverty -
where "more than 20% of the income after housing costs is spent on required fuel costs and there is insufficient residual income to maintain an acceptable standard of living."

LHEESs are primarily driven by Scotland's statutory targets for greenhouse gas (GHG) emissions reduction and fuel poverty:[3]

- Net zero emissions by 2045; and
- In 2040, as far as reasonably possible, no household in Scotland is in fuel poverty.

The Strategy should:

- Set out how each segment of the building stock needs to change to meet national and local objectives, including achieving zero greenhouse gas emissions in the building sector, and the removal of poor energy efficiency as a driver of fuel poverty.
- Identify strategic heat decarbonisation zones, and set out the principal measures for reducing buildings emissions within each zone; and
- Prioritise areas for delivery, against national and local priorities.

Accompanying this Strategy is a Delivery Plan. This has been developed in partnership with key stakeholders and provides a strong basis for action for local communities, government, investors, developers and wider stakeholders, pinpointing areas for targeted intervention and early, low-regrets measures. The Strategy and Delivery Plan will be reviewed and updated on a five-year basis.

[1] The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 (legislation.gov.uk)
[2] Local heat and energy efficiency strategies and delivery plans: guidance - gov.scot (www.gov.scot)
[3] Local heat and energy efficiency strategies and delivery plans: guidance - gov.scot (www.gov.scot)

3.2 Strategy Scope and Limitations

The scope is focused on heat decarbonisation, energy efficiency and fuel poverty and does not include wider energy system planning directly, but the LHEES can be used as a building block for wider Local Authority energy planning.

While there are some limitations with the domestic building dataset, which is primarily based on Home Analytics, it is of sufficient quality and reliability to allow detailed analysis and conclusions.

However, the non-domestic data outputs are primarily based on Non-Domestic Analytics and the Scottish Heat Map Dataset. The Non-Domestic Analytics dataset in particular is less reliable overall, containing more estimates that can vary from reality in a more significant manner than the domestic dataset.

The non-domestic buildings have a wider variety of implications for heat decarbonisation, but a significantly more limited dataset leads to limitations in the level of detail achievable through the outputs from analysing non-domestic buildings. Therefore, whilst the non-domestic building stock is included in the baselining, analysis and results – the majority of the analysis on pathways and future decarbonised systems is based on the domestic datasets.

4. Background Information

4.1 LHEES Structure, Function and Scope

4.1.1 LHEES Structure

As established in the Local Heat and Energy Efficiency Strategies (Scotland) Order 2022, LHEES should have a two-part structure: a Strategy and a Delivery Plan. This Strategy document sets out the current state of play and assesses the solutions to be employed, while the accompanying Delivery Plan sets out actions to support implementation of this Strategy.

Whilst these have been produced as separate documents, they should be evaluated together to provide the full, holistic overview of options and actions for heat decarbonisation throughout East Dunbartonshire

4.1.2 LHEES Considerations

The LHEES guidance sets out the key considerations for this Strategy, shown in Table 2. These help to categorise building stock into groups that require similar interventions.

Table 2: LHEES Considerations

	No.	LHEES Considerations	Description
Heat decarbonisation	1	Off-gas grid buildings	Transitioning from heating oil and LPG in off-gas areas
Heat decarbonisation	2	On-gas grid buildings	On-gas grid heat decarbonisation
Heat decarbonisation	3	Heat networks	Decarbonisation with heat networks
Energy efficiency and other outcomes	4	Poor building energy efficiency	Poor building energy efficiency
Energy efficiency and other outcomes	5	Poor building energy efficiency as a driver for fuel poverty	Poor building energy efficiency as a driver for fuel poverty
Energy efficiency and other outcomes	6	Mixed-tenure, mixed-use and historic buildings	Mixed-tenure and mixed-use buildings, listed buildings and buildings in conservation areas

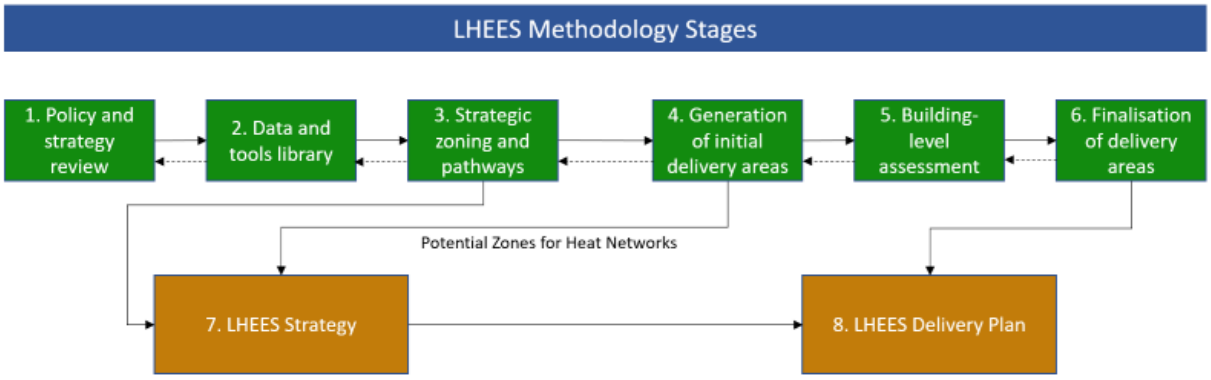
East Dunbartonshire Council policies do not differentiate by connection to the gas grid or if buildings are mixed tenure, mixed use, and historic buildings. Instead, the policies apply to the full array of building stock. Whether a building is currently on the gas-grid or not can have an implication on the economic viability of the decarbonisation of heat options, as well as the impact that decarbonising heat can have on fuel poverty.

4.1.3 LHEES Approach

A suggested LHEES methodology is supplied by the Scottish Government as shown in Figure 1. Although the approach used is based on the proposed methodology shown below, the details have been adjusted to suit the specific context of East Dunbartonshire. The methodology is broken down into eight stages that align with the work set out in the LHEES Guidance.

The completion of these stages provides East Dunbartonshire Council with the data analysis and evidence base to enable development of this Strategy and the accompanying Delivery Plan document. The stages are interlinked; completion of work carried out in stages 1-4 feeds into the Strategy, and the completion of stages 4-6 alongside the Strategy feeds into the Delivery Plan.

Figure 1: Summary of LHEES Approach and Stages



4.2 Heat Decarbonisation Interventions

There are a range of potential low carbon heat sources which are likely to play a role in the LHEES. A technology agnostic approach has been taken to consider the full range of technologies without bias, weighing up the advantages and disadvantages of each measure on fuel poverty and decarbonisation. Table 3 summarises these technologies. In assessing the impact of interventions, this Strategy considers the heating energy consumption of properties (in kWh) and the specific heating energy demand (kWh/m^2). The resulting improvements in Energy Performance Certificate (EPC) rating or Standard Assessment Procedure (SAP) score are not considered. This is because the associated rating improvement would change with future methodological adjustments. Some alterations are already planned, and these methodologies may continue to be adjusted over time. This focus on the heat demand of these buildings in isolation provides clarity on the real-world impact, particularly around fuel poverty.

There may be differences in prioritisation for specific projects based on the methodology for assessing energy efficiency applicable at that time.

Table 3: Heat Decarbonisation Interventions

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
Energy efficiency	Measures such as double glazing, draught proofing and insulation improve the thermal performance of the building fabric. This reduces the energy demand, which in turn increases the viability for switching to low carbon heat sources.	Improved energy efficiency leads to reduced energy costs, which reduces fuel poverty. Grants and loans are available for lower income households.	The Heat in Buildings Strategy (HIBS) sets the target for all homes to be energy efficient and supports necessary action for reaching at least the equivalent of EPC band C (higher bands reflect better thermal insulation), by 2033. Where feasible and cost-effective, these measures are supported by the LHEES.
Heat pumps	Heat pumps use electricity to extract heat from the air, ground, water or wastewater. Grid electricity is continuing a trend of decarbonisation through renewable energy.	Appropriately designed and well-running heat pumps can reduce costs, particularly compared to electric heating. Savings are dependent upon the relative price of electricity compared to the fuel displaced as well as the coefficient of performance (COP) of the installation. Replacing electric heating with a heat pump can reduce energy consumption and reduce fuel poverty.	Heat pumps are commonly used in cold climate, such as Scandinavia and research has found that all UK house types are suitable for heat pumps[4]. Where necessary, upgrades to heat emitters or hot water storage can present practical challenges in some properties. The electricity network will need to accommodate increase in electricity demand from heat pumps, direct electrical heating, and other energy sources such as Electric Vehicles. Hot water production is usually provided through a hot water cylinder, which requires space in a property.
Heat networks	Heat networks use waste heat, heat pumps or bioenergy as their energy source. Source of heat needs to be adjacent to the heat demand to keep costs low.	The Competition and Markets Authority found that up to 90% of heat network customers enjoy similar, or lower, bills than those with standard gas boilers and heat networks can cut both emissions and bills.	Heat networks are suitable for all building types but only in areas with a sufficient density of heat demand. Where they are suitable, they can alleviate constraints associated with other low carbon heat sources, such as limiting plant space required in specific buildings and being able to provide hot water in properties without sufficient space for a hot water tank.
Electric heating	Electricity used to generate heat directly. Grid electricity is continuing a trend of decarbonisation through renewable energy.	While direct electric heating is more efficient than combustion boilers, including gas, the high cost of electricity must be considered for households at risk of entering fuel poverty. Storage heaters can be used to harness cheaper electricity at night but can emit and waste heat when not required.	Electric heating is suitable for all properties with a suitable electricity connection. These may be more suitable for well insulated and (or) small properties and do not require radiators or wet underfloor heating to be pre-installed. Electric heating can also be used in conjunction with other low carbon heating technologies, such as to provide top-up heat in a hard to treat room or to heat a space used intermittently. In properties using solely electric heating, Hot water production is usually provided through a hot water cylinder, which requires space in a property.

[4] An Energy System Catapult electrification of heat project in the UK finds all housing types are suitable for heat pumps.

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
Bioenergy	Sustainably sourced, bioenergy (i.e., solid biomass, biogas or biomethane) is regarded as carbon neutral	There is uncertainty surrounding the future supply of bioenergy and biomass boilers tend to have more maintenance requirements than gas boilers	HIBS indicates that bioenergy is likely to have a limited role in the decarbonisation of the building stock. There may be some buildings with limited options to replace fossil fuels, for which bioenergy can play a role (for example, in hard to treat off-gas properties where heat pumps are unsuitable). A Draft Bioenergy Policy Statement Consultation was published in March 2024[5] and the UK's Green Gas Support Scheme aims to increase the proportion of biomethane in the gas grid. However, sustainable production and air quality concerns need to be considered in urban settings.
Hydrogen	Green hydrogen is produced by splitting water using renewable electricity while blue hydrogen is produced from fossil fuels plus carbon capture. Therefore, both production routes are deemed as low carbon in UK and Scottish legislation. Increased availability of hydrogen for heat will have positive implications for the suitability of hybrid heat pump systems, which may be cost-effective solutions	Currently hydrogen is an underdeveloped fuel and is associated with high costs. The future of hydrogen prices is uncertain but may become competitive with other energy sources in the coming decades. However, without Government incentives prices for green hydrogen are unlikely to be lower cost than using direct electrical heating or heat pumps as hydrogen system efficiency is lower than using electrified heating.	The HIBS sets the target to ensure that new boilers for properties are hydrogen ready by 2026. However, hydrogen is not currently available for supply of heat to domestic properties in East Dunbartonshire **and is not seen as an immediate solution[6].**

The 2021 Heat in Buildings Strategy (HIBS)[7] states that for the period to 2030, focus must be placed on accelerating the deployment of tried and tested measures where they are known to be no or low regrets. These have been identified to be:

- Energy efficiency measures for both existing and new buildings;
- Individual heat pumps in buildings off the gas network which currently use high carbon heating fuels;
- Heat pumps for on-gas buildings where initial assessments suggest heat pumps are likely to be cost effective and are less likely to receive a main hydrogen gas supply in the future; and
- Low and zero emission heat networks in areas deemed suitable.

[5] Bioenergy - draft policy statement: consultation - gov.scot (www.gov.scot)
[6] Delivering Net Zero for Scotland's Buildings - A Consultation on proposals for a Heat in Buildings Bill (www.gov.scot)
[7] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)

5. Policy and Strategy Context

5.1 LHEES Policy Context

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 stipulates that each Local Authority area must prepare and publish (a) a Local Heat and Energy Efficiency Strategy, and (b) a Local Heat and Energy Efficiency Delivery Plan by the end of 2023. These will be the principal mechanism for locally led plans for heat decarbonisation and energy saving mechanisms in buildings. Both the strategy and delivery plan must be kept under review and updated at five-year intervals. The Climate Change (Duties of Public Bodies: Reporting Requirements) (Scotland) Amendment Order 2020 places a statutory requirement for all public bodies to report their climate change mitigation actions (including the LHEES and the actions set out in the delivery plan) in the Public Bodies Climate Change Duties (PBCCD) Annual Reports.

The six LHEES considerations, as outlined in Table 2, are in two categories, namely "heat decarbonisation" and "energy efficiency and other outcomes".

On a UK level, there exists legally binding legislation to reach net zero emissions by 2050. The Net Zero Strategy: Build Back Greener[8] report denotes than one third of emissions are a result of heating for homes and workplaces. The UK Government is responsible for regulation of the electricity and gas networks and markets. Other targets have been set coincidingly to facilitate the necessary measures to achieve net zero, such as reaching 600,000 heat pump installations nationwide by 2028.[9]

The Scottish Government has more ambitious targets than the UK as a whole, with the Climate Change (Emissions Reduction Targets) Act 2019 (Scotland) committing to reach net zero by 2045. There are certain powers which are devolved to the Scottish Government such as promoting renewable energy and energy efficiency, while many aspects of energy policy are reserved by the UK Government. Chapter 10 of the Heat in Buildings Strategy (HIBS)[10] discusses the need for the UK and Scottish Government to work alongside each other to facilitate the decarbonisation of heat.

While there is a commitment from the Scottish Government to increase funding for Local Authorities to deliver affordable homes[11], the UK government's revised ambitions for additional housebuilding proposes adjustments to planning and housing policies with possible implications for the Barnett consequential. While these developments are aimed at providing relief against Britain's housing crisis and high costs of living, there is significant focus on developing brownfield sites and delivering onshore wind and solar projects.[12]

5.2 Heat Decarbonisation – Scottish Government Policy

The Scottish Government's Climate Change Plan update was published in December 2020[13]. The next full plan is due to be completed by early 2025. In April 2024, following advice from the Climate Change Committee (CCC) that the 2030 targets were no longer achievable[14], the Scottish Government announced plans to make changes to climate change legislation, including the abolition of the 2030 interim target (75 % of emissions by 2030 compared to 1990 levels) and a carbon budget-based approach to be adopted in forthcoming legislation. However, the 2045 net zero target remains and as part of this. Around 50% of homes and non-domestic buildings will still need to convert to a low or zero carbon heating systems within the decade. An investment of £1.6 billion has been earmarked for heat and energy efficiency over the next Parliament.[15]

The Heat Networks (Scotland) Act 2021 facilitates the policy context for developing heat networks, introduction of Building Assessment Reports (BARs) for public-sector and other non-domestic buildings and identifying the potential for each of Council building to be connected to a heat network. This is further supported by the Heat Network Delivery Plan.[16] The Heat Networks (Heat Network Zones and Building Assessment Reports) (Scotland) Regulations 2023 imposes a heat networks duty on local authorities to identify potential areas for

[8] Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk)
[9] Heat Pump Investment Roadmap (publishing.service.gov.uk)
[10] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[11] Affordable homes funding - gov.scot (www.gov.scot)
[12] Housing targets increased to get Britain building again - GOV.UK (www.gov.uk)
[13] Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot (www.gov.scot)
[14] Progress in reducing emissions in Scotland - 2023 Report to Parliament (theccc.org.uk)
[15] Increased funding to tackle fuel poverty and climate change - gov.scot (www.gov.scot)
[16] Executive Summary - Heat networks delivery plan - gov.scot (www.gov.scot)

Heat Network Zones (HNZs) through both the development of the LHEES and the production of a Heat Network Review Statement. The outputs from the heat networking analysis will feed into the Heat Network Zones Review Report.

The Heat in Buildings Strategy sets out a pathway to zero building emissions by 2045 and describes 111 actions and proposals that the government will take to work towards these targets, which includes phasing out fossil fuel boilers in off and on gas properties by 2025 and 2030 respectively. A new provisional renewable heat target is presented whereby at least 22% of non-electrical heat in buildings is to be supplied by renewable sources by 2030, (a significant increase from today's estimated 4 % level). A consultation on the upcoming Heat and Buildings Bill was also held by the Scottish Government in January 2024, where EDC agreed to support the bill and its overarching implications for the public sector. It is anticipated that the Heat in Buildings (Scotland) Act will be introduced during 2024/25 and will impose a legal duty for the Council to **transition all of its buildings to clean heating systems in advance of the 2038 deadline**. This will require the replacement of all gas heating systems with zero direct emissions heating systems by then, and further includes:

- prohibiting the use of polluting heating systems after 2045;

- requiring new property owners to discontinue the use of polluting heating systems within a fixed period (following completion of sale or when a heat network connection is available in a Heat Network Zone);

- introducing legislation requiring homeowners to make properties meet a reasonable minimum energy efficiency standard by 2033 and requiring the private rental sector to meet this minimum energy efficiency standard by 2028.

In addition, the Historic Environment Policy for Scotland (HEPS)[17] - in line with the Scottish planning policy[18] - provides guidance on approaching listed historic buildings for retrofits and decarbonisation. Around 19% of Scotland's building stock are traditional constructions and identifying where tailored solutions (being a key sector for LHEES consideration 6) for zero emission heating systems and energy efficiency measures may be needed would be needed for delivering the LHEES.[19]

These policies altogether feed into the LHEES Considerations (outlined in the Scottish Government Local heat and energy efficiency strategies and delivery plans: guidance) of:

1) Off-gas grid buildings;
2) On-gas grid buildings;
3) Heat networks; and
4) Poor building energy efficiency as a driver for fuel poverty.

5.3 Energy Efficiency – Scottish Government Legislation

The Tackling Fuel Poverty in Scotland: A Strategic Approach[20] sets the target to maximise the number of fuel poor households attaining Energy Performance Certificate (EPC) B by 2040. At the time of writing, the Scottish Government are consulting on an EPC reform, which likely will have an impact on the grading of the building stock and the effect of measures.[21]

Since 2017, the number of Scottish households living in fuel poverty has been on an upward trajectory (further aggravated by economic impacts of the Covid-19 pandemic) with 31% of households estimated to be in fuel poverty, of which 18.5% record extreme fuel poverty for 2022- the highest on record for the last decade. Data on EPC records show that almost 41% of homes in EPC rating F or G, and around a quarter of households living in dwellings rated EPC rating C or better, are fuel poor.[22] Records from 2019 show that 43% of households facing fuel poverty are using electricity as their primary heating fuel, which is the highest proportion compared to 22% gas, 28% using oil and 31% using other fuel types.[23] The significant rise in energy costs combined with rising inflation in recent years are contributing to fuel poverty. Therefore, Audit Scotland have

[17] Historic Environment Policy for Scotland | Historic Environment Scotland
[18] Scottish planning policy - gov.scot (www.gov.scot)
[19] Publication | The Engine Shed | Part of Historic Environment Scotland
[20] Tackling fuel poverty in Scotland: a strategic approach - gov.scot (www.gov.scot)
[21] Energy Performance Certificates - Energy efficiency - gov.scot (www.gov.scot)
[22] Key Findings Summary - Scottish House Condition Survey: 2022 Key Findings - gov.scot (www.gov.scot)
[23] Scottish Fuel Poverty Map - EAS

suggested additional legislative support to ensure that the net zero transition does not incur further costs to the public.

The Scottish Government will require that all residential properties in Scotland achieve an EPC C rating by 2033, where technically and legally feasible and cost-effective. For the social rented sector, no housing should be let after 2025 if the EPC rating is lower than an EPC D rating. For the owner occupier sector, new energy efficiency regulations will be introduced between 2023 to 2025.

The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 ("The Fuel Poverty Act") sets a new definition of both fuel poverty and extreme fuel poverty, focusing on low-income households and targeting resources for the most vulnerable communities. This sets an overarching target that in the year 2040, as far as reasonably practicable, no household in Scotland is in fuel poverty and, in any event, no more than 5% of households are fuel poor, no more than 1% are in extreme fuel poverty and the fuel poverty gap is no more than £250 (in 2015 prices). The legislation sets interim targets within this for 2030 and 2035. The four main drivers of fuel poverty are identified in the Fuel Poverty Act as energy prices, income, energy efficiency of the home and how energy is used in the home. These main drivers are also reflected through the Social Impact of Multiple Deprivation (SIMD) profiling within the area. Under the revised definition, East Dunbartonshire records comparatively low fuel poverty rates (at 22%) and extreme fuel poverty rates (at 7%) by local authority, than the national average.[24]

These policies feed into the LHEES Considerations of:

4) Poor building energy efficiency;
5) Poor building energy efficiency as a driver of fuel poverty; and
6) Mixed-tenure, mixed-use and historic buildings.

5.4 Summary of Policy and Legislation

Scotland boasts a suite of legislation that supports the transition to Net Zero. These cover overarching targets for emission reduction and heat supply, energy efficiency drivers and planning, and support for skills development and Just Transition. Refer to Appendix B for a summary. These national and regional policies and strategies (refer to Appendix B for a summary) guide local actions as outlined in section 5.5, and opportunities to secure funding (refer to Appendix M for an outline) for place-based decarbonisation measures, energy efficiency improvements and projects targeting alleviation of fuel poverty.

5.5 Local Policy and Strategy, and Linkages

Relating to the LHEES Considerations, the Council's strategies, policies, and plans have been reviewed with specific areas of local analysis highlighted for relevance.

Table 4: Local Policies and Strategies

Strategy, Policy, Plan	Description	Linkages
Climate Action Plan (CAP) (in development)[25]	The Climate Action Plan is currently being developed to set out how EDC will delivery against its targets to reach net zero in scope 1 and scope 2 emissions (from buildings and energy) by 2036 and the area-wide net zero target by 2045 while bolstering resilience to the impacts of climate change. This work will supersede the existing climate change policies and delivery plan set out in the 2019 SCCF and will encompass the actions outlined in the Draft CAP's Options & Evidence Report[26] which was approved by Council in 2023. It also builds on the Council's emissions monitoring framework as set out in the Carbon	LHEES considerations 1-6 are included in theme 2: heat and buildings decarbonisation.

[24] Fuel poverty and extreme fuel poverty: estimates
[25] https://www.eastdunbarton.gov.uk/residents/sustainability-and-climate-change/climate-action-plan-cap-newsletters
[26] Ricardo report template (moderngov.co.uk)

Strategy, Policy, Plan	Description	Linkages
	Management Plan. The CAP aligns local climate actions with the national targets set in the Climate Change (Scotland) Act 2009[27] and the 2021 Glasgow City Region Adaptation Strategy and Action Plan.[28] The Draft CAP is expected to be taken to the Council in late 2024, while the SCCF will continue to guide EDC's actions for emissions reductions and climate change adaptation until the final CAP is in effect.	
Sustainability and Climate Change Framework (SCCF)[29]	The SCCF has set the context for a strategic, cross-council approach to sustainability since 2016 as the strategic driver of sustainability ambitions, with a wide range of commitments beyond climate change mitigation and adaptation, such as targets to improve sustainable development. The Place Neighbourhood & Corporate Assets (PNCA) committee approved the most recent iteration of the SCCF in 2024, which included updates on sections covering Sustainable Economic Growth, Procurement and the Built Environment, which are all relevant to the LHEES. Setting ambitious energy efficiency and heat decarbonisation targets for local housing and agreeing on how the Corporate Asset Management Plan will support the objectives of the SCCF and emerging CAP/ LHEES (through Corporate Asset Management Group) are key relevant objectives.	LHEES considerations 1-6 (the LHEE strategy and delivery plan feeds into the actions incorporated into the CMP and CAP as an extension of the SCCF).
Carbon Management Plan (CMP) 23-24[30]	The CMP estimates and analyses the Council's corporate greenhouse gas emissions (with built assets accounting for the highest proportion) arising from the use of electricity and fossil fuels. Interim Carbon Management Plans are being published under EDC's commitment to report annual greenhouse gas emissions, since being introduced in 2015. The PNCA Committee approved EDC's short-term emissions target for the 2023/24 financial year extending the CMP until the end of this period.	LHEES considerations 1-4 and 6 (the LHEE strategy and delivery plan feeds into the actions incorporated into the CAP as an extension of the CMP).
Local Housing Strategy (LHS) 2022-2028[31]	The LHS drives the delivery of national and local priorities of increasing housing supply across all tenure types while setting the strategic direction for EDC and its partners to tackle area-wide housing related issues. The Council's net zero targets and actions related to the LHEES and CAP are incorporated into in the LHS through the following actions: - **Action 2.3** Reassess capital investment plans to work towards energy efficiency targets, ensure compatibility with net zero targets, and include retrofit of the following: energy efficiency measures, heating and ventilation systems and renewables while ensuring adherence to the New Build Heat Standard. - **Action 2.7** Adopt joint working approaches with agencies and services to contribute to the delivery of statutory net	LHEES considerations 1-6.

[27] Climate Change (Scotland) Act 2009 (legislation.gov.uk)
[28] Regional Economic Strategy - Glasgow City Region
[29] Sustainability and Climate Change Framework (SCCF)
[30] Carbon Management Plan (CMP) 23-24
[31] Local Housing Strategy 2022-2028

Strategy, Policy, Plan	Description	Linkages
	zero targets, actions to be confirmed in the LHEES delivery plan and actions to promote climate resilience in the CAP. - **Additional Action 2.21:** Adopt joint working to ensure the early identification of potential areas for Heat Network Zones and the alignment of housing development with the LHEES delivery plan and the Heat Network Review Statement. The LHS runs over a 5-year period (currently 2023-2028) and its delivery actions and outcomes are monitored annually.	
Strategic Housing Investment Plan (SHIP)[32]	The SHIP is the housing investment delivery plan for the LHS and sets out strategic investment priorities for affordable housing in East Dunbartonshire. It outlines how EDC and its partners will deliver these priorities and covers the 5-year period from 2023/24 to 2028/29. These priorities capture EDC and Registered Social Landlord (RSL) commitment to developing sustainable and zero carbon homes, increasing the supply and quality of affordable housing and promoting sustainability, energy efficiency and renewable energy technologies for all new affordable housing developments. New development will also comply with regulatory requirements under the Climate Change (Scotland) Act 2009[33] and EDC's Affordable Housing Investment Programme (AHIP 2) which is being informed by the LHS, LHEES, CAP and pilot projects and will provide guidelines to achieve Scottish Building Standards Gold Level of Sustainability and Passivehaus standards where possible.	LHEES considerations 1-6.
Home Energy Efficiency East Dunbartonshire Council's Statement of Intent[34]	The Flexible Eligibility (FE) Statement of Intent helps the Council to assist households vulnerable to fuel poverty with funded energy efficiency improvements. Energy companies of a certain scale are also required to help improve the energy performance of domestic properties through the Energy Company Obligation (ECO) while prioritising households facing fuel poverty. This could reduce carbon emissions, fuel costs and energy consumption through insulation measures and boiler replacements.	Focuses on LHEES considerations 4 and 5. However considerations 1, 2, 3 and 6 may be relevant depending on property type and technology applicable.
Economic Recovery Plan (ERP) 2021[35]	EDC's Economic Recovery Plan sets out local actions to support local businesses and residents through the economic crisis caused by Covid-19, as required by the Scottish and UK Government policies. These actions fall under 4 themes: - Business: actions relating to financial support and recovery of business activity. - People: actions focused on employment and socio-economic equality.	LHEES considerations 1-6.

[32] East Dunbartonshire Strategic Housing Investment Plan 2023/24 – 28/29 | East Dunbartonshire Council
[33] Climate Change (Scotland) Act 2009 (legislation.gov.uk)
[34] Home Energy Efficiency East Dunbartonshire Council's Statement of Intent
[35] Economic Recovery Plan | East Dunbartonshire Council

Strategy, Policy, Plan	Description	Linkages
	- Community: actions for regeneration and local investment. - Environment: actions promoting environmental sustainability alongside economic resilience. It forms part of the Community Planning Partnership's delivery of Local Outcome 1 of the Local Outcomes Improvement Plan (LOIP) and updates the 2017 Economic Development Strategy action plan. These delivery actions are closely linked with transition to net zero, energy efficiency, resilience and decarbonisation of heat and buildings, where business support and employment are among key priorities.	
Local Development Plan (LDP) 2 2022[36]	EDC's Local Development Plan 2 was adopted in November 2022. - Policy 9 on Climate Change, Sustainability and Energy Infrastructure requires all new development to be designed in a way that minimises energy consumption and carbon emissions in accordance with the energy hierarchy and requires applications to be accompanied by a Sustainability and Energy Statement. The policy also supports the creation of heat networks and renewable and low carbon energy proposals. - All significant / anchor developments, substantial developments and development adjacent to heat networks / sources will be expected to establish the potential for, and viability of, decentralised energy centres and heat networks. - Development proposals will be expected to address their heat demand in line with the LHEES and investigate the feasibility of alternative heat sources and the implementation of bespoke on-site solutions. - Development of any type must not prejudice the potential for future heat networks to be developed and should include appropriate infrastructure for connection or safeguards to allow future connection. The National Planning Framework 4 now forms part of the development plan and is underpinned by the need to reduce carbon emissions in order to meet net zero. - The policy intent of NPF4 is to encourage, promote and facilitate development that supports decarbonised solutions to heat and cooling demand and ensure adaptation to more extreme temperatures. - Where a heat network is planned but not yet in place, development proposals will only be supported where they are designed and constructed to allow for cost-effective connection at a later date.	Focuses on LHEES considerations 3 (heat networks), 4 (energy efficiency) and 6 (mixed tenure, mixed use and historic buildings).
Local Development Plan (LDP) 3 (in development)[37]	The LDP 3 (in development) will set out the spatial strategy towards achieving net zero carbon emissions in East Dunbartonshire. LDPs must encourage, promote and facilitate development that addresses the global climate emergency and nature crisis, in order to reflect the significant weight that this carries within NPF4.	Potential to facilitate LHEES consideration 3 (heat networks).

[36] Local Development Plan 2 | East Dunbartonshire Council
[37] Local Place Plans – invitation to create | East Dunbartonshire Council

Strategy, Policy, Plan	Description	Linkages
	Planning authorities are expected to use LHEES and the Scotland Heat Map to inform the potential for co-locating developments with a high heat demand together with or alongside sources of heat supply. The National Planning Framework (NPF) 4 (under policy 19) requires LDPs to consider the implications from the LHEES – identifying areas designated as heat network zones and areas for potential heat networks. Local authorities are thereby required to support developments in sites adjacent to heat networks where these are designed and constructed to connect to these existing networks, or if a heat network is at the proposal stage, adjoining developments should have the necessary infrastructure in place to allow a cost-effective connection to the network when it becomes available. Furthermore, LDPs are required to support necessary retrofits to connect to a heat network in the area.	
East Dunbartonshire Community Planning Partnership Local Outcomes Improvement Plan (LOIP) 2017-27[38]	The LOIP sets East Dunbartonshire Community Planning Partnership's strategic priorities and outcomes. East Dunbartonshire's LOIP outlines why and how we will work together to organise and provide services in a way that tackles known inequalities and includes a set of 10-year goals for the local area. The Local Outcomes and Guiding Principles of the LOIP include facilitating climate change adaptation and sustainability, to improve living conditions through improved and resilient built environment, sustainable economic growth, responsible use of natural resources and long-term strategic decisions to serve present and future generations. The LHEES has implications for Local Outcomes 1 (Economic Growth and Recovery) and 2 (Employment and Skills) through possible investments for green heating infrastructure and retrofits, and creation and support for green jobs, respectively. The considerations on fuel poverty and poor building energy efficiency link with Local Outcomes 5 (Adult Health and Wellbeing) and 6 (Older Adults, Vulnerable People and Carers).	LHEES considerations 1-6.
Corporate Asset Management Plan (CAMP)[39]	This Corporate Asset Management Plan facilitates the use of EDC's corporate assets to deliver the Council's vision while delivering public services and overcoming financial challenges for the public sector. The CAMP aims to incorporate measures for: • minimising energy demand through building design (super-insulation, airtightness and south-facing orientation) • meeting demand via onsite capture of renewable energy (solar PV, solar thermal, biomass, ground source heat pumps, etc.) • establishing district heating schemes • low-energy systems and appliances • climate-proofing buildings	LHEES considerations 1-4 and 6, with special focus on energy efficiency measures and heat networks.

[38] Community Planning in East Dunbartonshire | East Dunbartonshire Council

[39] Appendix 6 - Corporate Asset Management Plan.pdf (moderngov.co.uk)

Strategy, Policy, Plan	Description	Linkages
The Energy Efficiency (Domestic Private Rented Property) (Scotland) Regulations 2020[40]	The regulation sets out the intentions of Energy Efficient Scotland to require landlords of privately rented homes to meet minimum energy efficiency standards from April 2020. The intention is to achieve this through bringing forward regulations based on EPC ratings.	Focuses on LHEES consideration 4 (energy efficiency).
Building Standards Regulations 2024[41]	The iteration to Scottish building regulations prohibits new building from using direct emission heating and hot water systems (polluting systems like oil and gas boilers, and bioenergy), as a result of the consultations (held in 2021 and 2022) on proposals to end the use of fossil and biofuel in new buildings. The New Build Heat Standard (NBHS)[42] was introduced as part of the Scottish Government's broader Heat in Buildings Strategy[43] and requires all new builds to use clean heating systems like heat pumps and heat networks. It will be implemented through the Building (Scotland) Amendment Regulations 2023. Under the NBHS, all new builds and conversions (where reasonably practicable) that apply for a building warrant from 1 April 2024 onward are required to comply to the NBHS.	LHEES considerations 2, 3 and 4.
East Dunbartonshire Circular Economy Strategy (CES) 2023	Published in March 2023, the CES includes actions agreed upon across the Council that aim to: • support local businesses and third sector organisations to become circular for reducing scope 3 emissions • foster a Wellbeing Economy that prioritises people and the planet • align with the delivery of the Scottish Government's Circular Economy Route Map and comply with any new legislation introduced by the proposed Circular Economy Bill. The CES assists in reducing embodied carbon in building construction (reducing material wastage and reliance on new mining/ sourcing), promoting refurbishment, recycling and reuse. While this reduces the whole life carbon emissions in buildings, the LHEES will complement this by driving operational carbon reductions.	LHEES considerations 4 and 6

[40] The Energy Efficiency (Domestic Private Rented Property) (Scotland) Regulations 2020
[41] Building Standards Regulations 2024
[42] New Build Heat Standard - gov.scot (www.gov.scot)
[43] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)

5.6 Summary of Ongoing Work at East Dunbartonshire Council

East Dunbartonshire Council is undertaking extensive work to support emissions reductions. To ensure that there is alignment between this on-going work and the development of the LHEES, various internal and external events were held (as summarised in appendix H). The input received in these events played a key role in defining and developing strategic delivery zones and for developing the accompanying delivery plan. Ongoing actions that are relevant to the LHEES are summarised below:

5.6.1 Housing:

EDC is actively working with Registered Social Landlords (RSL) to undertake energy efficiency measures targeting poorly insulated domestic properties as part of actions supported by Energy Efficient Scotland: Area Base Schemes (EES:ABS). Stock condition surveys has been planned to improve the records on EDC's housing stock, which would allow prioritised action for properties in poorer conditions. These actions support **a fabric first approach** and reflect LHEES consideration 5, contributing towards alleviating poor energy efficiency as a driver of fuel poverty.

Facilitating the clean heat transition:[44]

The Council has partnered with Scottish Power Energy Networks (SPEN) and energy supplier E.ON on an innovative £1.09 million project exploring the decarbonisation of heating. To complement the financial contributions from SPEN and E.ON, the Scottish Government has provided funding to EDC to allow eligible homeowners in the area to have air source heat pumps and new thermal battery and technology installed. The funding will allow 50 off-gas homes to receive a contribution of up to £3000 towards a major home upgrade – a heavily discounted rate of around 85%.

Affordable Housing Standards:

The Council and RSLs are promoting development of sustainable, zero carbon homes where this meets the twin aims of reducing fuel poverty and carbon emissions. Delivery partners will promote sustainable design, energy efficiency measures and renewable heat and energy technologies in all new affordable homes, complying with the Climate Change (Scotland) Act 2009.

The Local Housing Strategy (LHS) framework and Council's own Affordable Housing Investment Programme (AHIP2) will also support Scottish Building Standards Gold Level Aspects 1 and 2 Sustainability, promoting Passivhaus levels where viable. All new development set out as part of the SHIP, will adhere to new core standards in relation to such aspects as carbon free heating systems.

5.6.2 Internal Actions:

Recent activities and plans for Council buildings

Extension and refurbishment to Lennoxtown's 5G pitch (2024):

The pavilion will be powered by a new air source heat pump replacing old electric heating system.

Clean heat system upgrade:

A small Council office at Southbank Road has switched from gas to electric heating, which will have a positive effect on emissions reductions.

Milngavie Nursery

All required design development to construct a new Milngavie Early Years Centre in ongoing with process to be reported to committee in due course; The new facilities would have zero direct emissions heating systems and high energy efficiency standards.[45]

[44] Re-Heat Project, Scotland | E.ON (eonenergy.com)

[45] See page 137 (Public Pack)Agenda Document for Council, 21/08/2024 17:30 (moderngov.co.uk)

The new Balmuildy Primary School

The proposal is paused[46] but would include the installation of zero direct emission heating systems, if revisited at a future date.

Milngavie and Bearsden Primary Schools refurbishment:

The proposed refurbishments have been paused[47] but would include the installation of zero direct emission heating systems, if revisited at a future date.

The New Allander Centre (2023):

Has a gas-powered combined heat and power plant with gas boilers. The new building is more efficient and includes energy conservation features such as heat recovery technology, to reduce energy usage. However, it is noted that the direct emitting heating system will contribute to climate change over the course of its lifespan and will need to be replaced with clean heating systems before 2038 to comply with the forthcoming Heat in Buildings (Scotland) Act.

The new Additional Support Needs school at Woodland View School (2023):

Has gas combined heat and power and gas backed up boilers, replacing Campsie View School in Lenzie and Merkland in Kirkintilloch. While the new building is more efficient than the previous buildings, it is likely these new schools will consume more electricity due to more technology in the buildings requiring electricity in addition to heat recovery units and air conditioning in the buildings. It is also noted that the direct emitting heating system will contribute to climate change over the course of its lifespan and will need to be replaced with clean heating systems before 2038 to comply with the forthcoming Heat in Buildings (Scotland) Act.

Boiler replacements at local schools:

It is proposed that the boilers at Castlehill Primary School, Holy Family Primary School and Gartconner Primary school, all be replaced. These are expected to lead to minor short-term reductions in gas use as more efficient heating systems are used. However, these will also lock in new emissions throughout the lifetime of the boilers which will need to be replaced with clean heating systems before 2038 to comply with the forthcoming Heat in Buildings (Scotland) Act.

Climate Action Plan (CAP):

The Draft CAP will be published in 2024 to set out how to achieve East Dunbartonshire Council's target to reach net zero by 2036 for scope 1 and 2 emissions (including emissions from the Council's buildings, fleet of vehicles and energy that the Council purchases such as electricity), net zero by 2045 for all other emissions including area-wide while bolstering East Dunbartonshire's resilience to the on-going effects of climate change. It will build on the CAP's Evidence and Options Report which was approved by Council on 28 September 2023.[48] It covers eight strategic themes (see Figure 2), with a series of actions approved by the Council to achieve these targets. The LHEES falls under CAP theme 2: "Buildings and Heat Decarbonisation", while reducing construction waste and embodied carbon are further elaborated under theme 5: "Consumption and Waste".

Themes 6: "Business and the Economy" and 7: "Supply Chains, Investment and Digital Infrastructure" are also strongly linked to the LHEES through opportunities to support economic growth and a just transition towards net zero, while alleviating fuel poverty and managing supply chains to meet changing demands and procurement trends with the net zero transition.

The CAP would therefore be significantly influenced by the LHEES and accompanying delivery plan.

[46] See page 137 (Public Pack)Agenda Document for Council, 21/08/2024 17:30 (moderngov.co.uk)
[47] See page 137 (Public Pack)Agenda Document for Council, 21/08/2024 17:30 (moderngov.co.uk)
[48] See Agenda for Council on Thursday, 28th September, 2023, 5.30 pm (moderngov.co.uk)

Figure 2: Overview of the content for each of the eight themes in the CAP

1) **Transport:**
Switching to significantly more walking, cycling and zero carbon public transport modes, making car-free living more viable across East Dunbartonshire and converting the remaining Council fleet vehicles to zero carbon fuels.

2) **Buildings and Heat decarbonisation**:
Retrofitting buildings to become energy efficient, carbon neutral and resilient to a changing climate with the Council leading by example on the decarbonisation of its buildings. Maximising local renewable energy generation and increasing system resilience while facilitating the electrification of heat including through smart electricity usage.

3) **Sustainable Place and Communities**:
Ensuring that planning and patterns of development make low-carbon lifestyles and local resilience more viable with a presumption against proposals that would lead to additional emissions or create dependence on high carbon transport and infrastructure.

4) **Natural environment:**
Restoring, protecting and enhancing greenspaces and biodiversity as the climate continues to change.

5) **Consumption and waste**:
Reducing the emission intensity of consumption through responsible buying of goods and services and zero carbon waste management.

6) **Business and the Economy:**
Supporting businesses to become carbon neutral and climate resilient, capturing job opportunities and bolstering investment to thrive in a low-carbon, wellbeing economy while supporting a just transition to ensure that nobody is left behind.

7) **Supply Chains, Investment and Digital Infrastructure**:
Driving forward carbon neutral supply chains by reducing emissions from the Council's supply chain and investments and exploiting digital and technological opportunities that drive forward decarbonisation in order to leave East Dunbartonshire less exposed to climatic hostility, hazards and financial vulnerability including exposure to stranded assets.

8) **Food and Agriculture**:
Establishing a resilient sustainable supply chain, with food and drink produced locally and enhanced community food growing, in addition to supporting movement to a plant-based diet.

5.6.3 Community Planning Partners

Carbon Literacy Training:[49]

EDC has partnered with Keep Scotland Beautiful to deliver Free Climate Emergency Training for businesses (based in East Dunbartonshire or linked to the area) and FREE Community Climate Emergency Training targeting residents and those employed in East Dunbartonshire (including EDC employees). Participants who complete the training will have the opportunity to be certified as Carbon Literate, after gaining knowledge of the carbon costs and impacts of activities, and an understanding of how to identify practical actions to reduce their contributions and vulnerability to climate change. The training also presents the opportunity to set businesses on the route to be accredited as a Carbon Literate Organisation – which is a great way to showcase corporate social responsibility and bring co-benefits of Carbon Literacy to your organisation. The training will

[49] Climate Change Resources | East Dunbartonshire Council

be delivered by environmental charity Keep Scotland Beautiful and has been designed in partnership with East Dunbartonshire Council and East Dunbartonshire Voluntary Action. The training is fully funded by the UK Government, with £42,175 being provided through the UK Government's Shared Prosperity Fund.

The Community Learning and Development Plan (CLD) 2021-2024:[50]

The plan includes objectives in relation to identified needs and priorities such as improving employability by working with and supporting individuals and communities to make improvements in their lives and their local environment. This may be done through community-based learning or community action and poses opportunity to build the necessary technical skills as needed for transitioning to renewable heating sources and retrofits for energy efficiency. A one-year extension of the existing plan is being developed prior to the introduction of a new three-year plan.

The East Dunbartonshire Community Planning:[51]

Community Empowerment (Scotland) Act 2015 places a statutory obligation for local authorities to engage local communities. EDC's community planning is informed by the Local Outcomes Improvement Plan (LOIP) 2017-27. This approach aims to:

- ensure local people engage in decision-making related to public services which affect them;
- improve all of the services offered through close coordinated working;
- help organisations identifying and addressing the needs and views of communities.

Using a place-based approach[52], the Community Planning Partnership (CPP) focuses on areas with high inequality and involves partnering with communities to plan and provide the necessary services to improve their living conditions. These Locality Plans empower communities by creating stewardship. It aims to address poverty and inequalities within a community by establishing an action plan to address community needs, by involving residents, organisations and partners. The initial area to be identified for intervention determined by a place approach was Hillhead, which was followed by Auchinairn, Lennoxtown and Twechar based on feedback from public services and communities.

5.6.4 Economic Development

The CAP's Evidence & Options Report's and SCCF set out actions that would support supply chain decarbonisation, help to create the conditions for decarbonisation of the economy, support reductions in embodied carbon (in alignment with the Council's Circular Economy Strategy), and provide support to businesses in reducing their emissions. This will build on previous Council investment in renewable energy which has brought built assets related emissions to a lower level than they would have otherwise been.

5.6.5 External actions: Climate Neutral Milngavie

A three-phase energy decarbonisation plan for Milngavie has been proposed as part of the CARES programme. Natural Power (NPC) were appointed as technical advisors to carry out the first two phases. The project is undertaken under the umbrella of the Community Council's (CC) ambitions and taking heed of the East Dunbartonshire Local Plan (EDLP).

Phase 1 included an options appraisal to determine the potential of heat pumps, district heating, solar PV, electrification of public transport, and heat from waste to meet the demand in areas of Milngavie.

Phase 2 involved a more detailed study of the options listed above and included the financial viability, deliverability, and carbon saving potential. Phase 3, which is not part of the current project, revolves around climate resilience and transport and nature-based solutions that will aid in sequestering carbon.

4 key areas were identified for this project: Lennox Park, Oakburn Park, Milngavie Reservoirs, and Public Land and Buildings.

Key takeaways from Phase 2 were that solar PVs and solar canopies were technically and financially feasible. However, floating solar PVs were ruled out due to a lack of local use for the electricity that would be generated, along with financial drawbacks. Additionally, heat networks were excluded because of the low heat demand in

[50] Community Learning and Development Plan 2021-24 | East Dunbartonshire Council
[51] Community Planning in East Dunbartonshire | East Dunbartonshire Council
[52] Place Approach: Auchinairn, Hillhead, Lennoxtown, Twechar | East Dunbartonshire Council

the centre of Milngavie, suggesting a lengthy payback period. It was also concluded that certain energy efficiency improvements could be considered as an add-on to the solutions proposed above.

6. Baselining

6.1 Baseline Summary Across East Dunbartonshire

What is LHEES baselining?

A baseline establishes the conditions and characteristics of the existing building stock within the area. This sets out the energy efficiency and implications for heat decarbonisation in domestic and non-domestic properties including age, gas grid connectivity, tenure type, EPC rating, energy source and heat demand. The baseline facilitates establishing strategic zones for analysis and setting decarbonisation pathways with respect to the LHEES Considerations.

6.1.1 Domestic Building Stock

The Home Analytics dataset (V3.9) was used to carry out baseline analysis. The dataset contains details of 48,675 properties. One property registered in the Springburn and Robroyston ward was removed as this was erroneous. A further 167 properties with no heat demand data and 6 properties with incomplete data on gas grid status were removed. **The remaining 48,501 properties were assessed as set out below**.

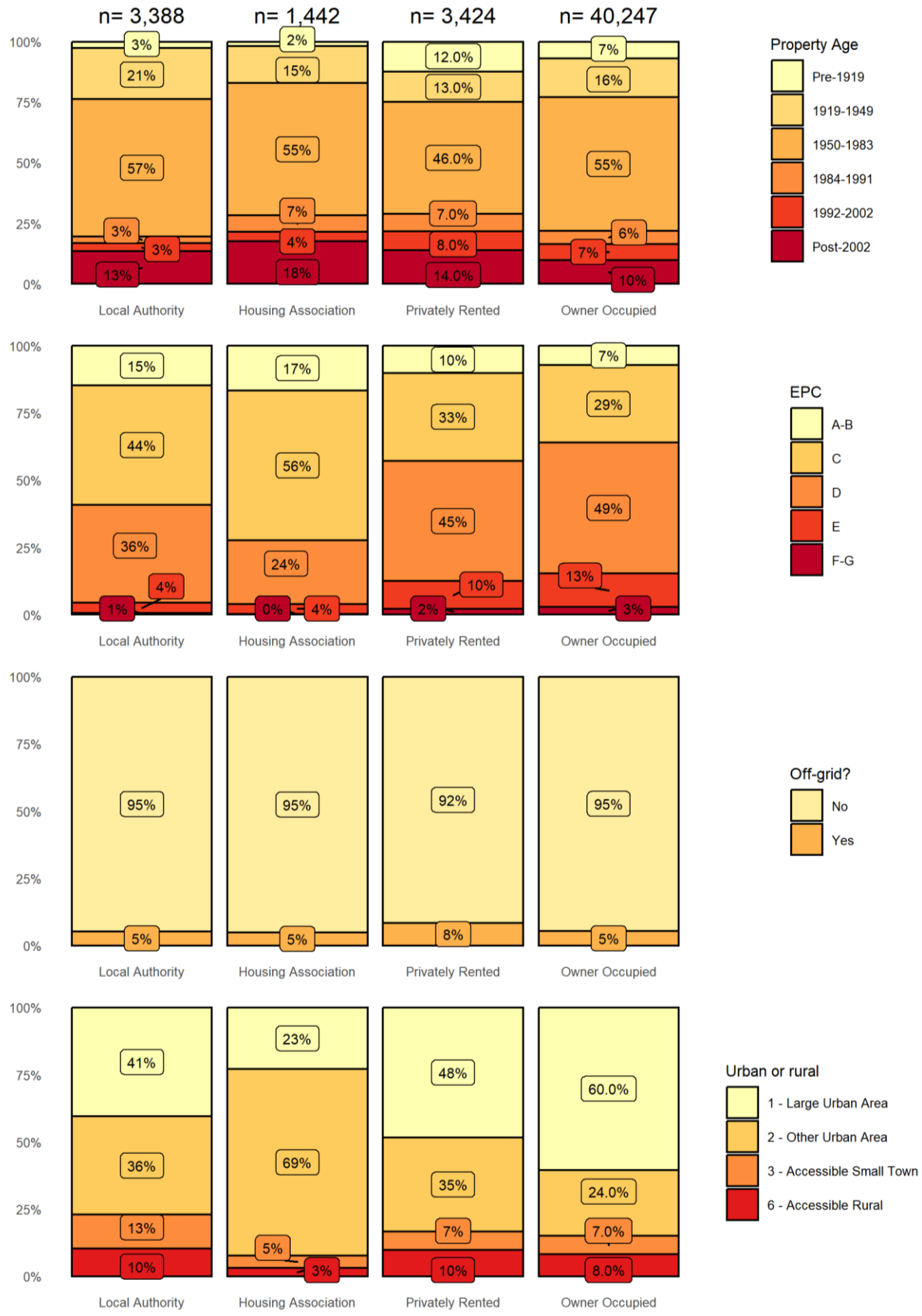
As shown in Figure 3, the vast majority of properties are in the private sector. Those private properties tend to have poorer EPC grades, with lower proportions achieving C or better than in the council or housing association owned groups. This suggests that the LHEES energy efficiency Considerations are more relevant to properties over which the Council has limited influence.

Whilst the majority of properties in each tenure group were built between 1950 and 1983, it is notable that the private rented sector holds the highest proportion of pre-1919 homes and this may present challenges with respect to the heat decarbonisation and energy efficiency Considerations in that sector. Note that around 19% of Scottish homes were constructed before 1919. The overall percentage of properties in East Dunbartonshire built before 1919 is significantly lower, which may indicate that this difficulty in decarbonisation will be a smaller issue in East Dunbartonshire, compared to other parts of Scotland.

East Dunbartonshire's homes are typically found in urban areas on the gas grid. Consequently the "Off-gas grid" decarbonisation Consideration represents a small proportion of properties. The Sottish Government's 8-fold Urban/ Rural classification is based on the size of the settlement rather than its density of occupation. Although the majority of East Dunbartonshire's homes are in urban areas, these areas are typically small-to-medium towns which lack great heat density. The suitability for these areas to be served by Heat Networks is covered in section 7.6.

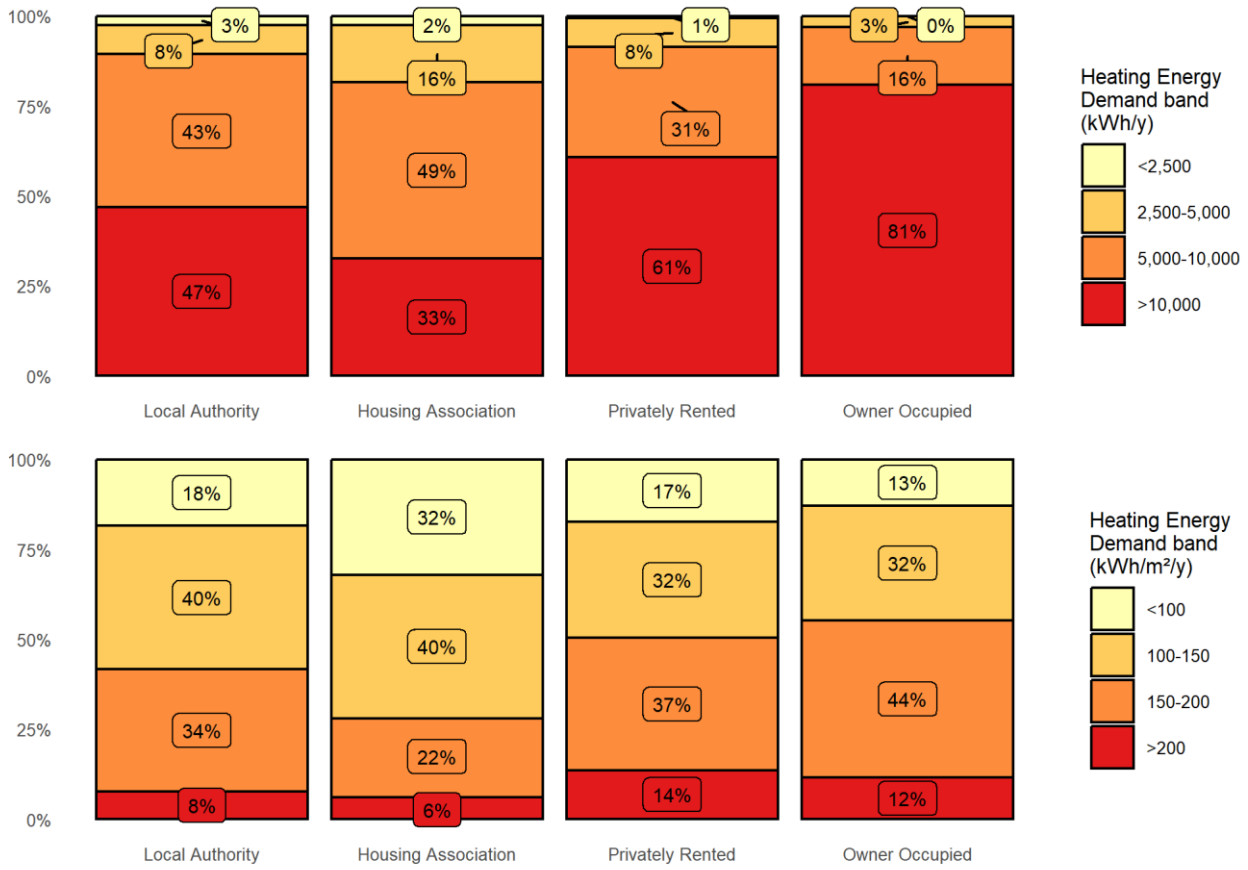
EPC ratings include a number of other factors in addition to a property's demand for heat and so the estimated heat demand from home analytics has been isolated to get a clearer picture of the effect which energy efficiency measures may have. In Figure 4, the properties have been split into bands, firstly by their total requirement for heat and, secondly, by the heat required per m². Representing heat demand in kWh/m^2 allows for the comparison of energy efficiency levels, as realistic as possible from the data. Since the LHEES consideration relates energy efficiency to fuel poverty reduction, the comparison highlights an overall potential to reduce fuel poverty by improving energy efficiency. **The highest energy demands sit in the private sector, and particularly in owner occupied properties**. The privately rented properties closely follow in high heating demands, which altogether indicate that the LHEES energy efficiency considerations are most relevant to homes over which the Council has limited influence. However, it is noticeable that the Local Authority properties perform poorly relative to the housing association properties with 44 % above 150 kWh/m²/y. To address the LHEES Consideration of fuel poverty, the number of units of heat must be reduced (kWh/year). However, since the size of a property is usually permanently fixed, targeting the kWh/m^2/year figure is a more appropriate metric to compare.

Figure 3: Domestic buildings- distributions of age, EPC rating and gas grid connectivity by tenure type



Note, for clarity, percentages rounded to nearest integer

Figure 4: Domestic heat energy demand



Note, for clarity, percentages rounded to nearest integer

6.1.2 Non-domestic Building Stock

The Non-Domestic Baseline Tool utilises data derived from Non-Domestic Analytics, which is not based entirely on concrete data collected from building owners but is, in large part, imputed from a few measured parameters. For example, the floor area of a building may be estimated from its footprint on a map and an estimated number of levels based on its height. The energy consumption may then be estimated by multiplying the estimated floor area by a benchmark figure for the building type. This can lead to errors, of course, and **so analytical results should be read with caution**. To improve accuracy, the Council's own energy data was used in place of the Non-Domestic Analytic data for all council buildings. Council buildings listed as closed or closing were removed, as were a handful of buildings with missing data.

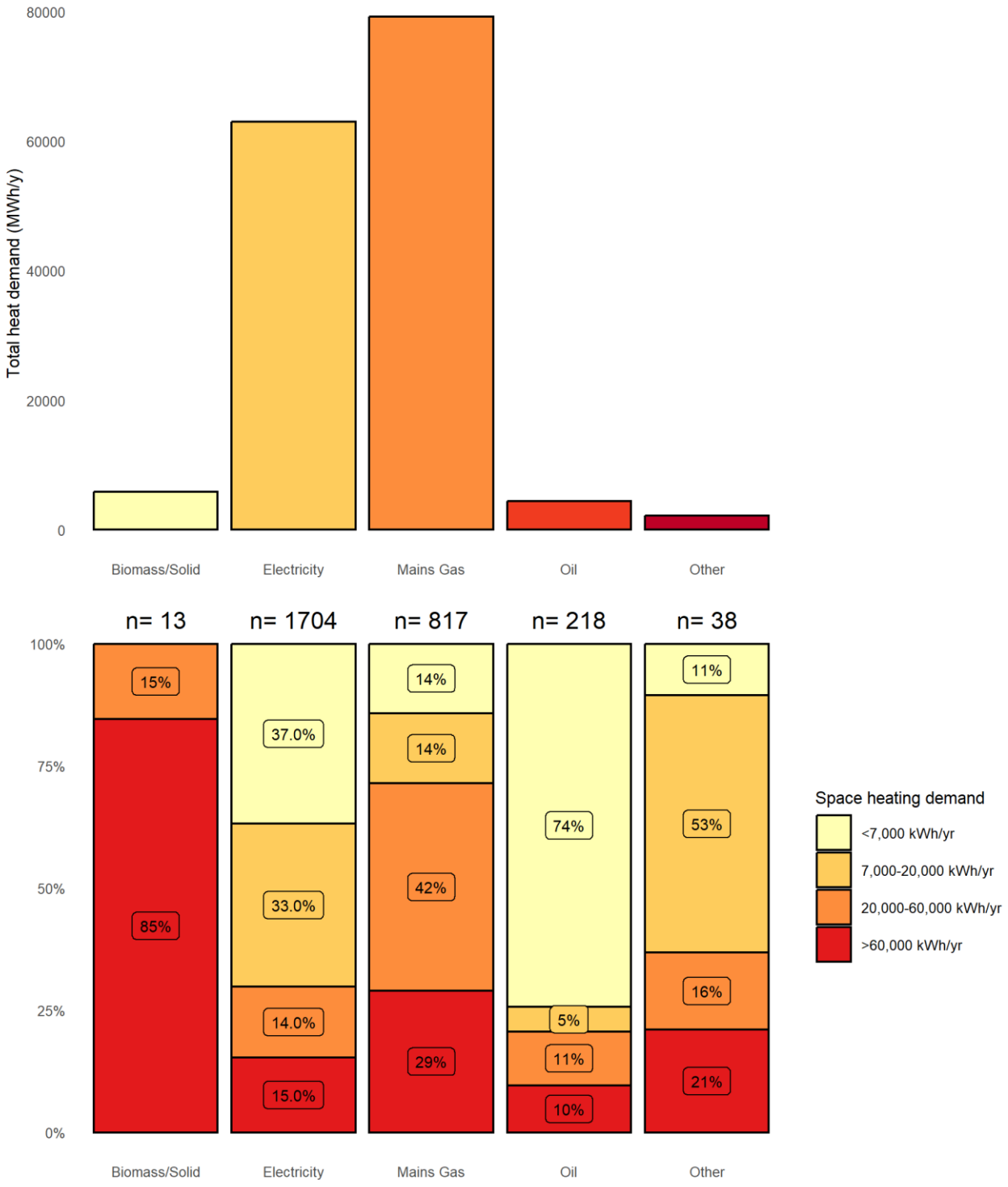
The data has been used for the baselining step of the LHEES process to get a flavour of the building stock. The Non-Domestic Analytics data records 2,790 non-domestic buildings in East Dunbartonshire. Together, these have an estimated total heat demand of 155,335 MWh/y, so around 20% of the total domestic heat demand (737,000 MWh).

Figure 5 shows the aggregated heat demand met by different energy sources. Mains gas provides the greatest amount of energy but electricity, which is considered a low-carbon source, supplies heat to more buildings than the other fuels combined. Mains gas tends to supply buildings with high heat demands, while electricity is skewed towards smaller demands and this is further highlighted in Figure 6. The vast majority of buildings are less than 500 m² and electricity is the most common fuel source for those smaller buildings.

Over 40% of the non-domestic stock was constructed before 1919, although the relative energy consumed by those buildings is not much different to that consumed by the post-1983 buildings (Figure 7), which possibly reflects the benchmark-based methodology for consumption estimates in the Non-Domestic Analytics dataset.

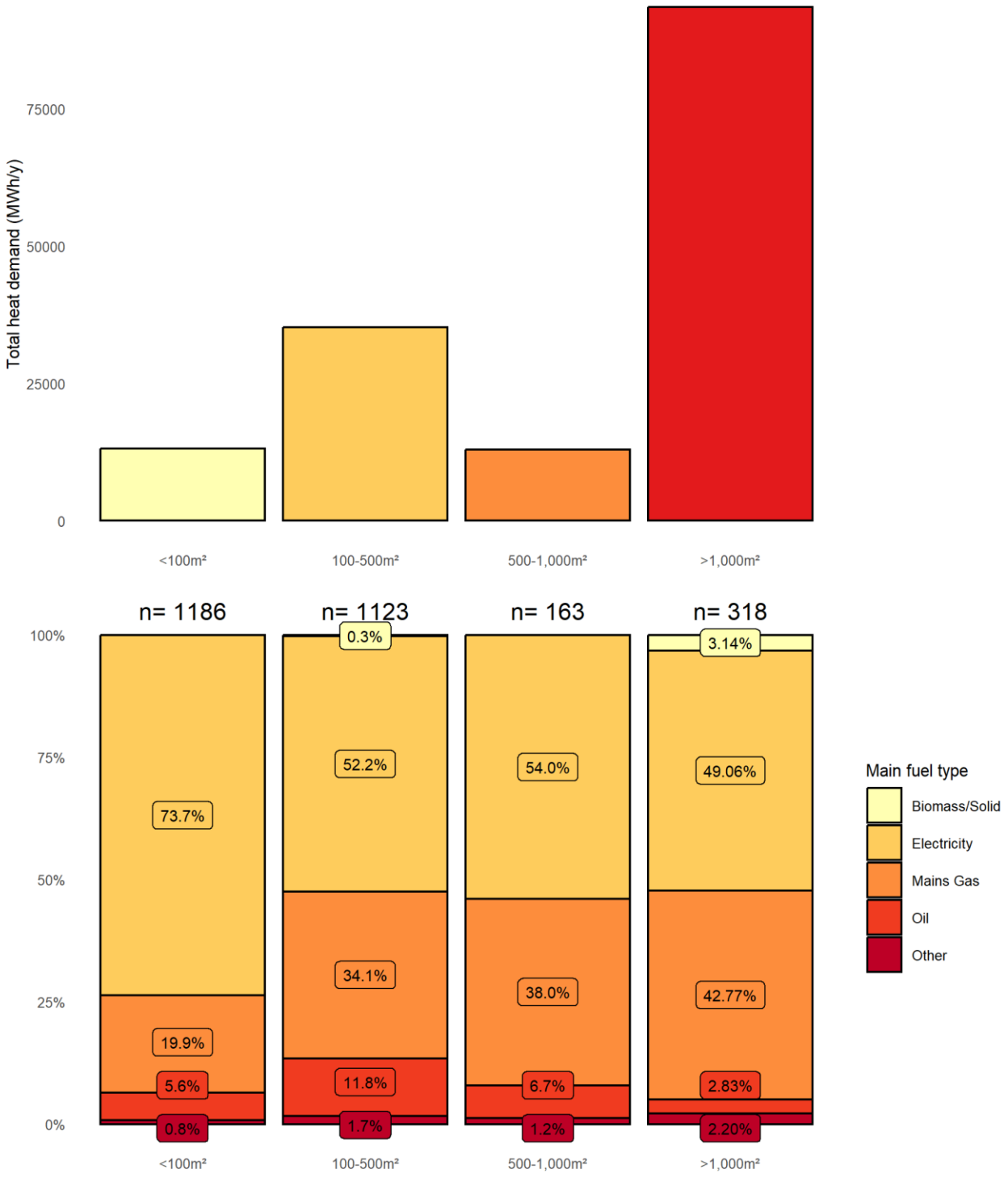
The majority of non-domestic buildings are classed as "offices and workshops" and "retail and finance", although it is "non-residential institutions" which consume the most energy for heat. This category includes sports buildings and schools, for example, and the Council, therefore, have influence over this consumption.

Figure 5: Non-domestic heat demand by energy source and demand category



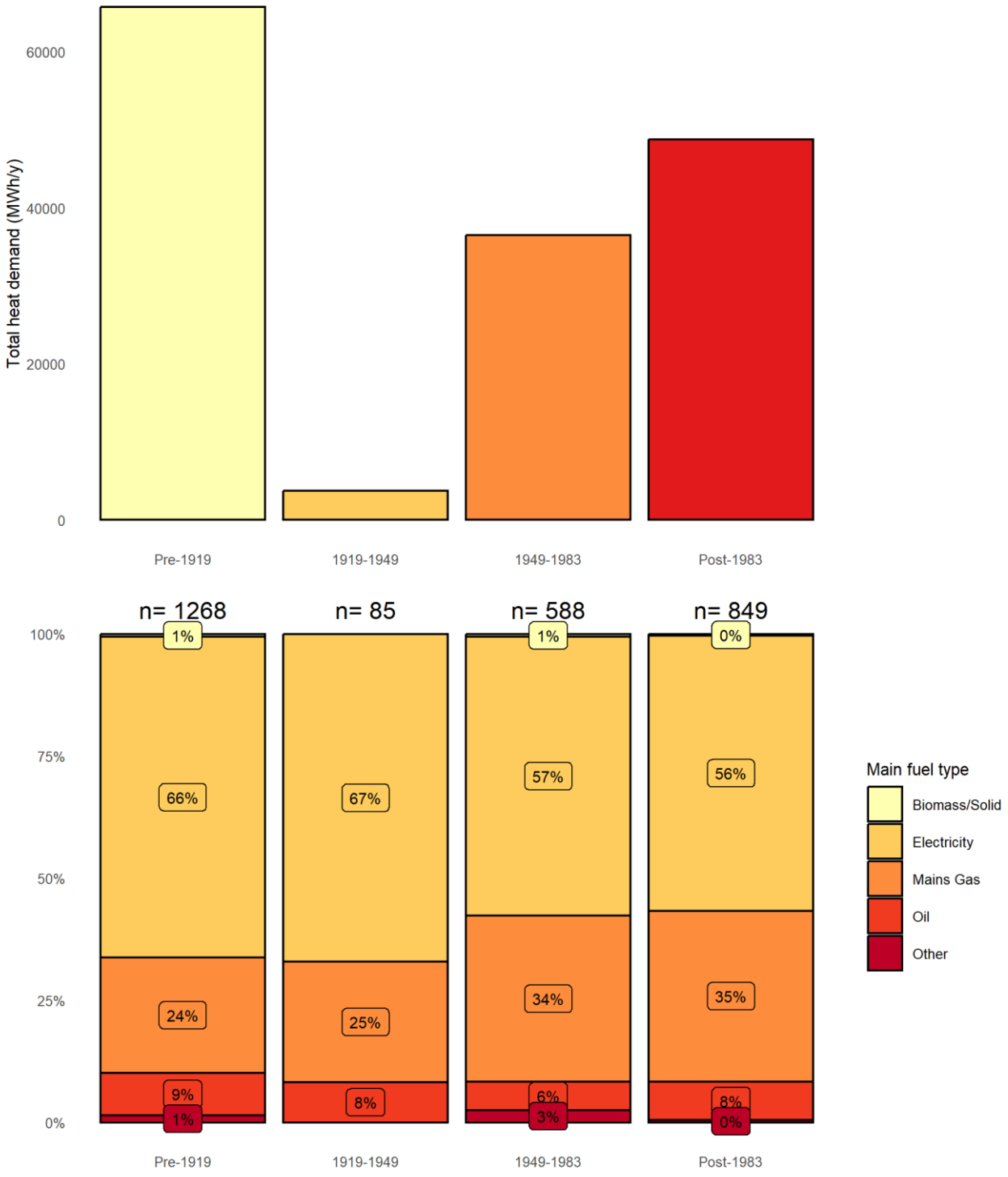
Note, for clarity, percentages rounded to nearest integer

Figure 6: Non-domestic heat demand by floor area category and energy source



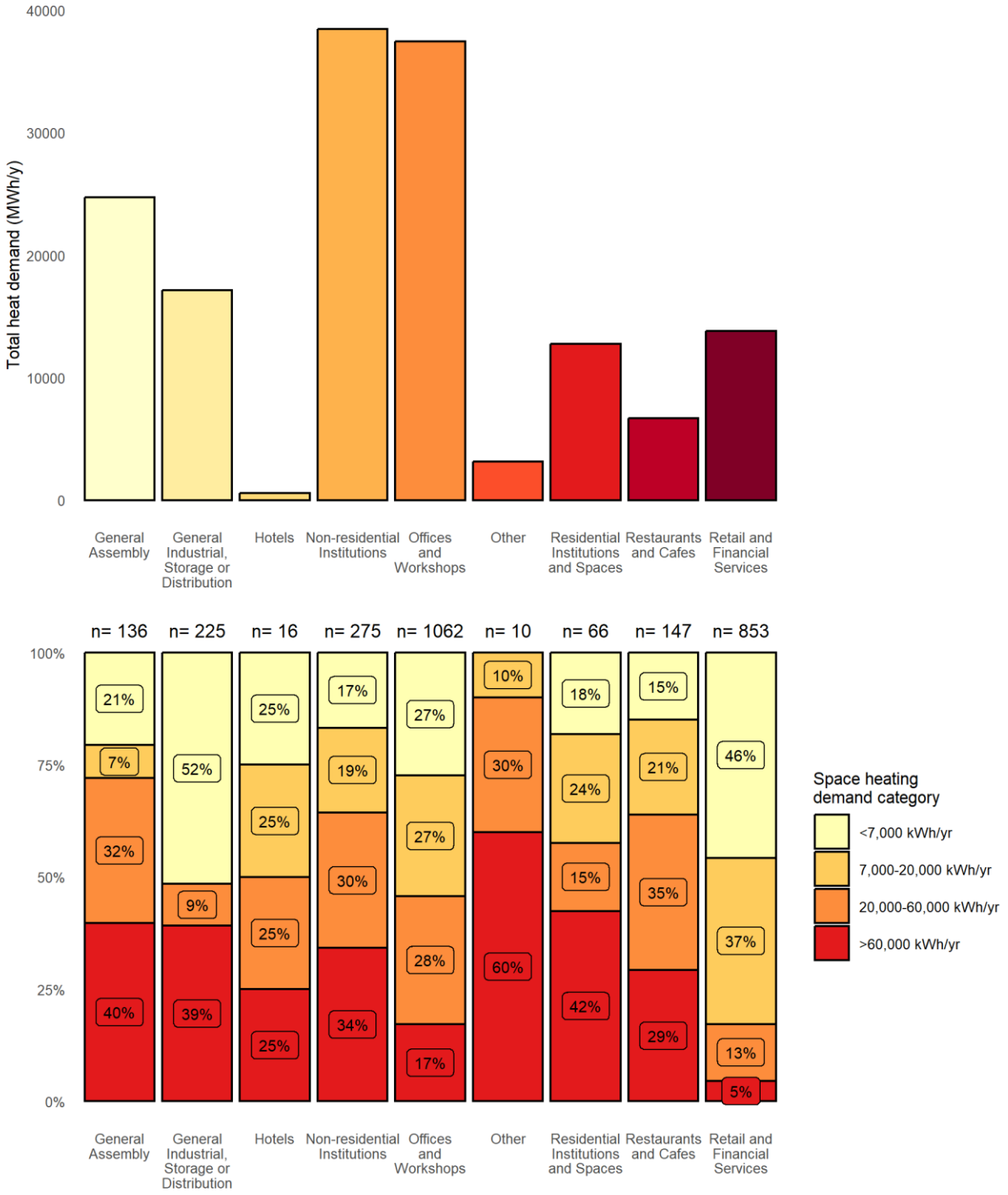
Note, for clarity, percentages rounded to nearest integer

Figure 7: Non-domestic heat demand by building age category and energy source



Note, for clarity, percentages rounded to nearest integer

Figure 8: Non-domestic building type by heat demand



Note, for clarity, percentages rounded to nearest integer

7. Generation of Strategic Zones and Pathways, Including Potential Zones for Heat Networks

7.1 Purpose

The LHEES Guidance requires the Council to set out Strategic Zones and develop a decarbonisation pathway for each. In this section, the approach to selecting Strategic Zones is described, as well as the attributes for each, which affect the strategic decarbonisation options.

7.2 Community Council Areas as LHEES Strategic Zones

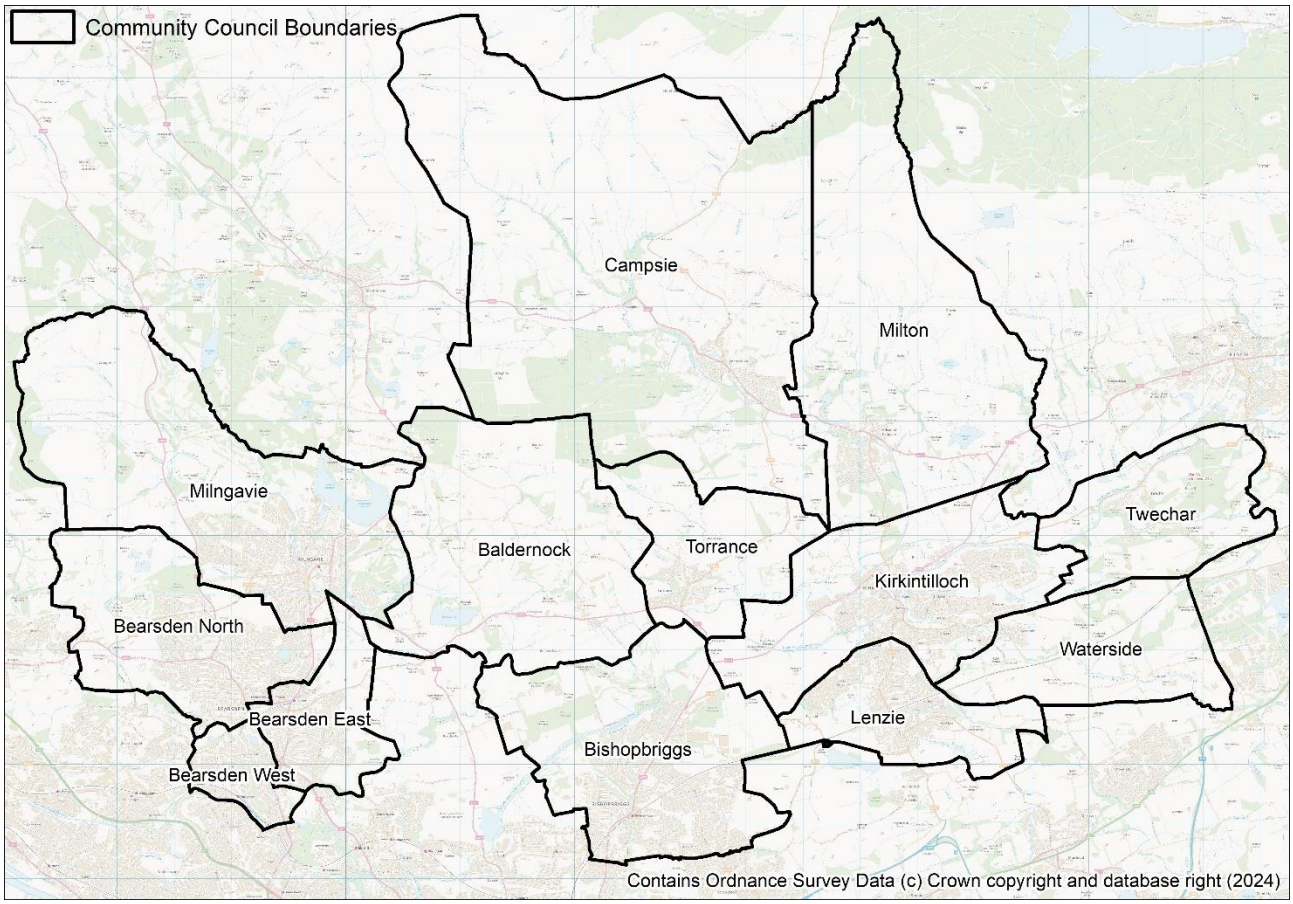
The standard methodology for LHEES generates ranked lists of places ("Intermediate" geographical zones) with the "poorest performing" homes with respect to the Core Indicators- i.e. domestic energy efficiency, domestic fuel poverty and domestic buildings and the gas grid (see Appendix C and Appendix I) - and thus generates targets for intervention. This analysis is presented in Appendix C.

However, it is also possible to examine the data by East Dunbartonshire's own Community Council boundaries and these were deemed to be more appropriate for planning the delivery of LHEES actions.

Community Councils are the most local tier of elected representation, voluntary action and administration that is supported by a Local Authority. Therefore, focusing on Community Councils as strategic zones represent opportunities for EDC to influence local decisions and collaborate with communities for actions to support area-wide decarbonisation targets. These strategic zones also provide a reasonable granularity for analysis and aligns with EDC's approach with deriving tangible delivery outputs that could have action champions nominated against them.

These zones are mapped out in Figure 9.

Figure 9: East Dunbartonshire's Strategic Zones



7.3 Domestic Properties and Tenure

The numbers of domestic properties in the Home Analytics dataset, broken down by Zone and tenure are given in Table 5.

Table 5: Domestic properties in the Strategic Zones

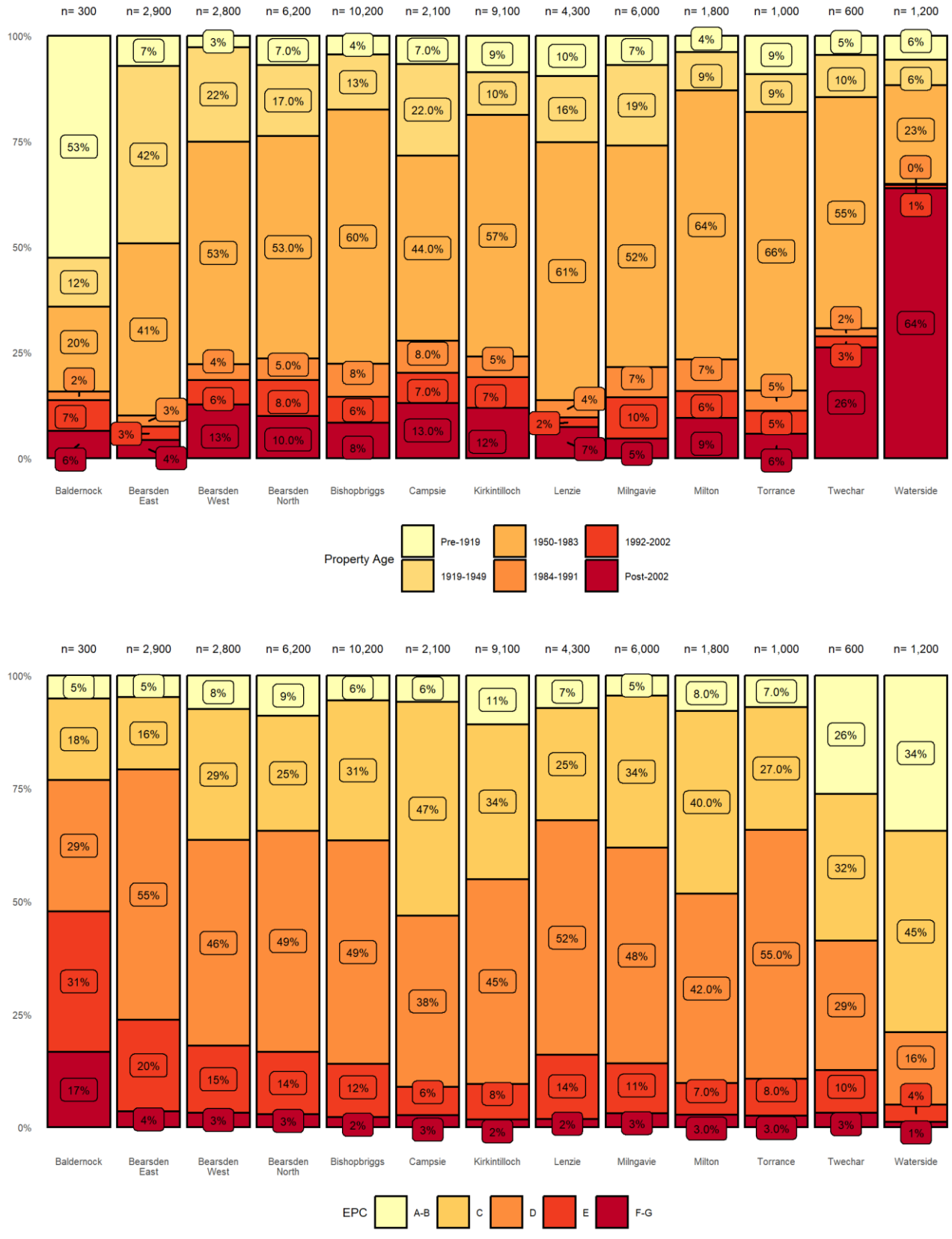
Zone	Total domestic properties	Tenure				Mixed tenure in parent building
		Local Authority	Housing Association	Private Rental	Owner Occupied	
Baldernock	293	5	1	25	262	8
Bearsden East	2,852	43	14	149	2,646	137
Bearsden West	6,177	90	10	157	2,568	363
Bearsden North	2,825	309	59	252	5,557	311
Bishopbriggs	10,218	501	183	739	8,795	975
Campsie	2,073	350	54	156	1,513	291
Kirkintilloch	9,109	827	976	928	6,378	1,949
Lenzie	4,293	311	22	306	3,654	292
Milngavie	5,953	489	74	406	4,984	779
Milton	1,803	91	14	118	1,580	71
Torrance	1,030	53	31	61	885	34
Twechar	629	197	1	38	393	60
Waterside	1,246	122	3	89	1,032	120

Note that by using Community Council areas as the Strategic Zones, the split of properties throughout these areas is uneven – Baldernock and Twechar for example have far fewer properties than the average, and Bishopbriggs and Kirkintilloch have much higher number of properties. However, this presents an opportunity to analyse the building stock and decarbonisation opportunities at a reasonable granularity that could support geographically targeted local actions where feasible.

A baseline assessment of these properties by area, similar to that in 6.1.1, is shown in Figure 10 and Figure 11.

Figure 10 shows a largely homogenous split of building ages and EPC ratings across most of East Dunbartonshire, with Baldernock having a much higher proportion of pre-1919 properties and Waterside and post 2002 properties respectively.

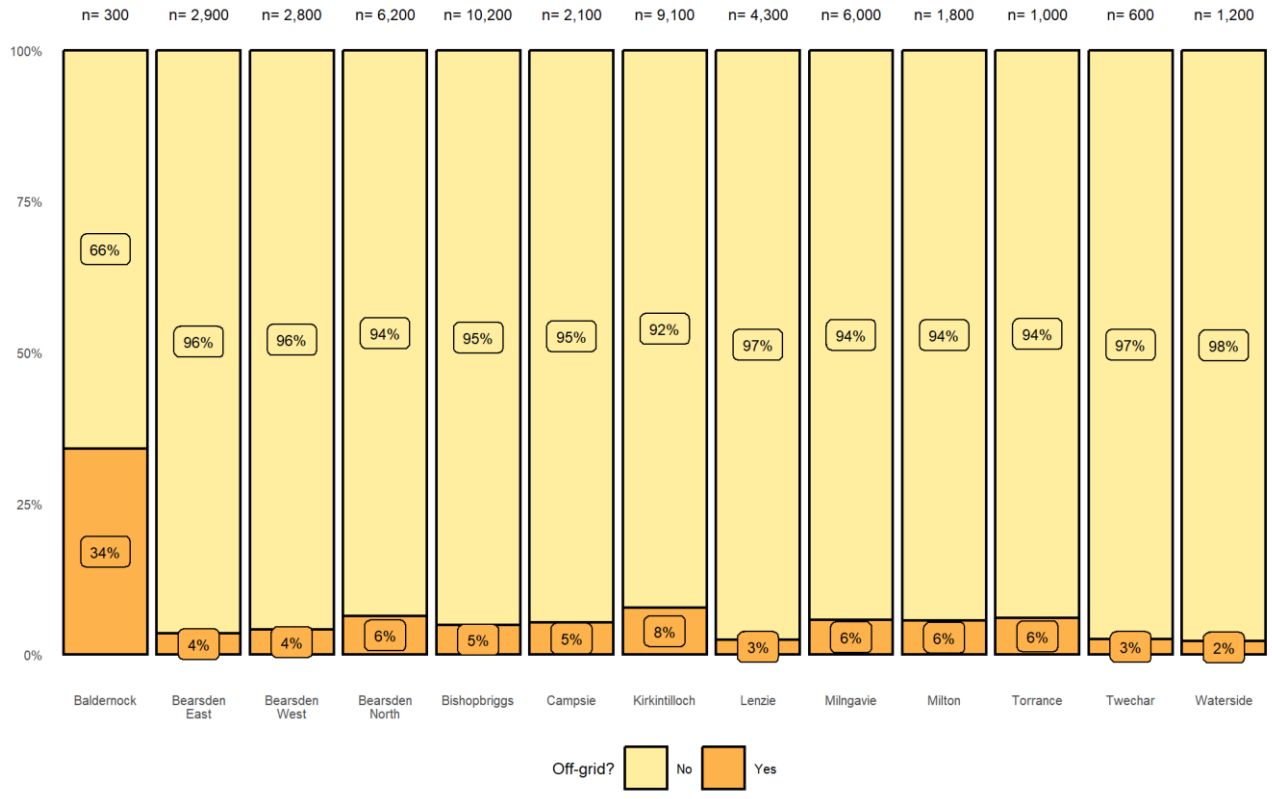
Figure 10: Baselining of domestic properties in the Strategic Zones, 1 of 2. Note the number of properties in each strategic zone is shown above the column (rounded for clarity), and relates to Table 5

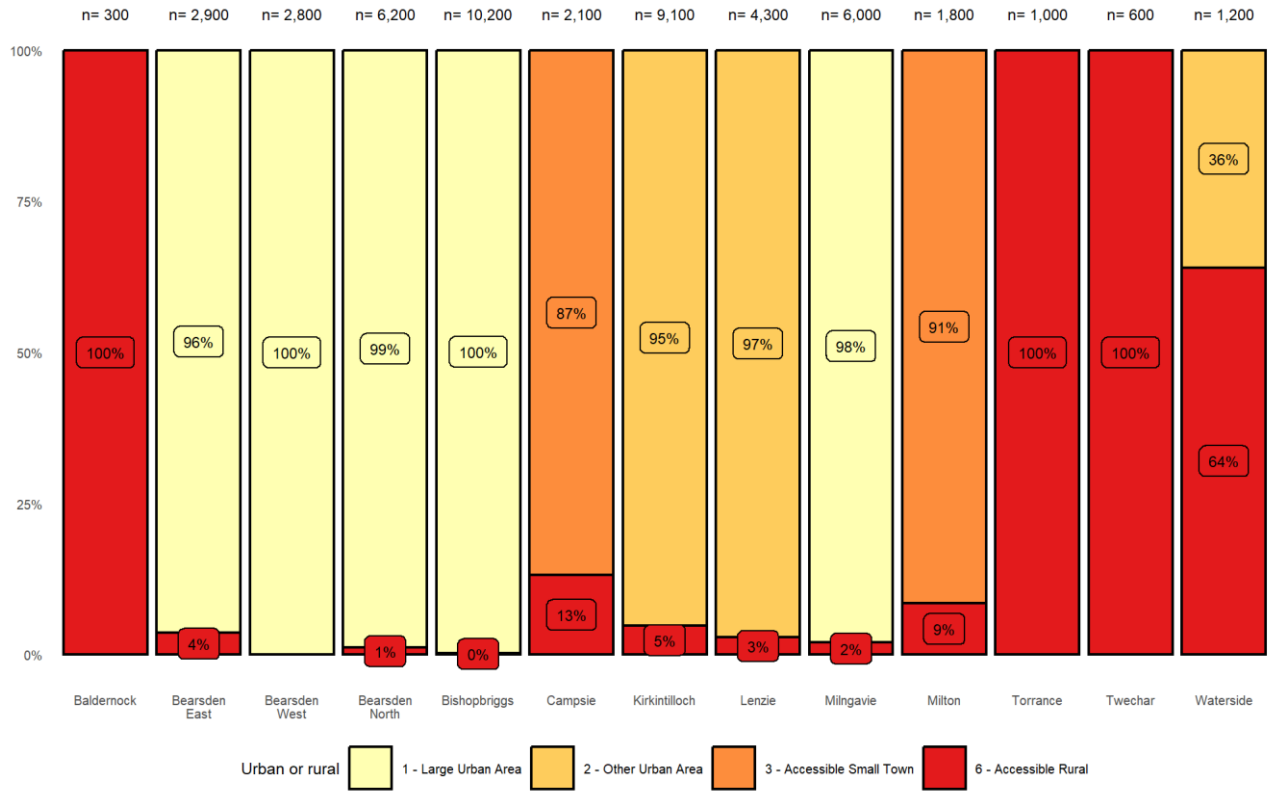


Note, for clarity, percentages rounded to nearest integer and counts rounded to nearest hundred

Figure 11 shows a very consistent on/off-gas split across East Dunbartonshire, with the exception of Baldernock which shows a higher proportion of off gas properties. It is both more rural and more sparsely populated than the other areas.

Figure 11: Baselining of domestic properties in the Strategic Zones, 2 of 2. Note the number of properties in each strategic zone is shown above the column (rounded for clarity), and relates to Table 5





Note, for clarity, percentages rounded to nearest integer and counts rounded to nearest hundred

7.4 Domestic Energy Efficiency

The Weighted Scores for energy efficiency (Table 6) for the strategic zones, using the default weightings based on the LHEES Methodology and outlined in Appendix I have been calculated. The default weightings have been used as these provide a balanced approach to energy efficiency interventions across EDC, and there are no clear drivers to diverge from the standard methodological approach. However, if individual energy efficiency measures were to be targeted, the weighting could be adjusted accordingly.

The EE measures that are deemed to be the most cost-effective and the corresponding default weightings used to generate the weighted score are:

	Default weighting
• Upgrade of single-glazed windows to double-glazing	33%
• Presence of uninsulated cavity walls	33%
• Loft insulation	33%

The weighted score is calculated by taking the percentage of housing stock in that area that meets the criteria listed above, multiplied by the weighted scoring index. This is similar to the approach for energy efficiency as a driver of fuel poverty, but without the fuel poverty indicators (see Appendix I). Non-default weightings can be used if specific interventions are to be targeted.

Note that a given property may require none, one, two or three of the proposed interventions and so the sum total of interventions is greater than the total number of individual properties which may require an intervention.

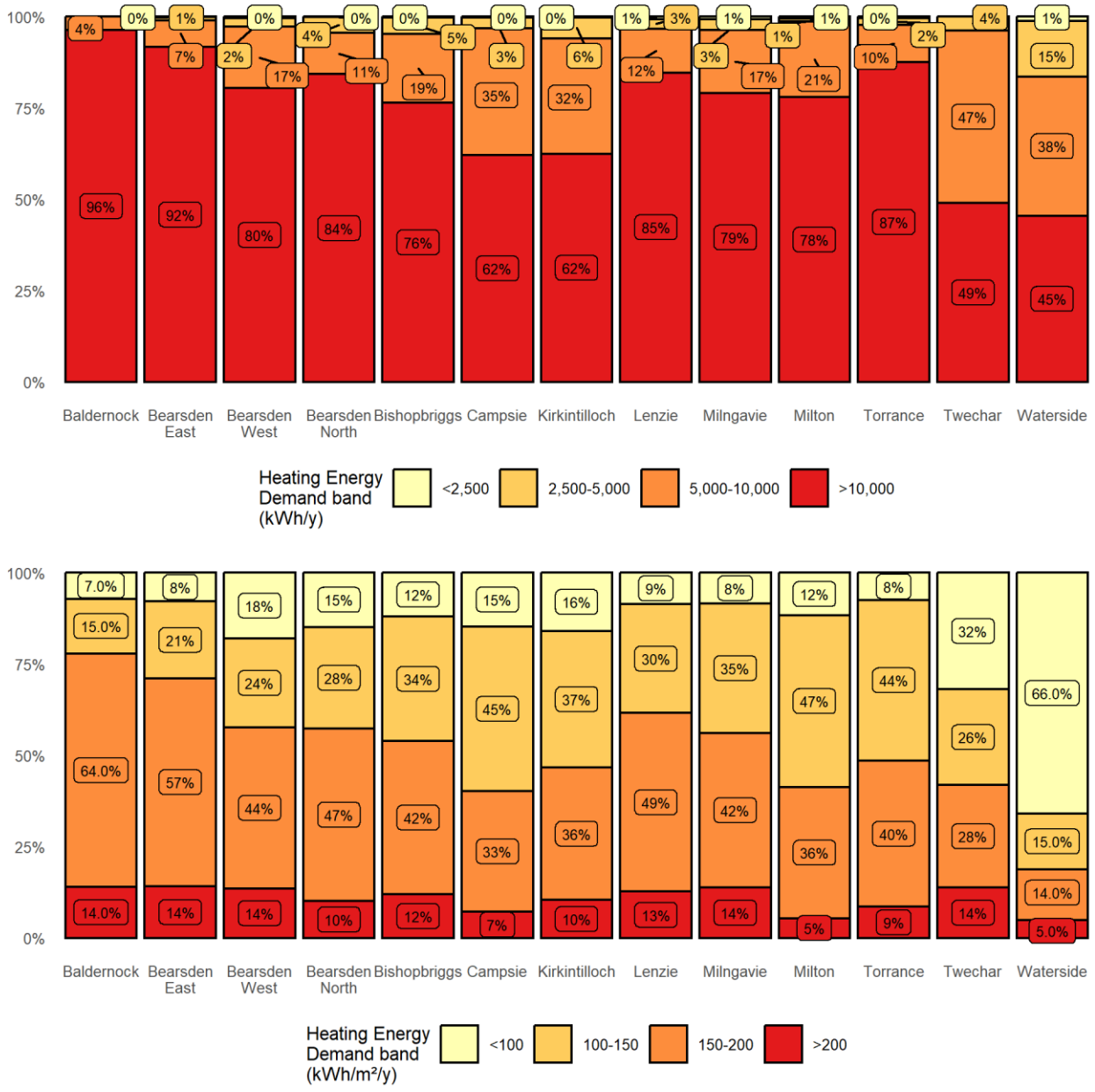
Most Community Council Zones are similar in their Total Weighted Scores but Baldernock stands out as being significantly higher while Waterside stands out as being significantly lower than the others. Figure 10 shows a breakdown of the EPC ratings in these areas and again shows the properties in Baldernock having a greater proportion of E and F ratings and Waterside a greater proportion of A to C ratings.

Table 6: Domestic energy efficiency weighted scores by strategic zone

Strategic Zone	Number of interventions required				Percentage of housing stock			Total Weighted Score
	Loft Ins.	Glazing Upgrade	Wall Ins.	Total number of interventions	Loft Ins.	Glazing Upgrade	Wall Ins.	
Baldernock	33	26	202	261	11%	8.9%	68.9%	30
Bearsden East	453	279	1,348	2,080	16%	9.8%	47.3%	24
Bearsden North	654	545	2,845	4,044	11%	8.8%	46.1%	22
Bearsden West	439	211	1,185	1,835	16%	7.5%	41.9%	22
Bishopbriggs	1,427	1,025	3,742	6,194	14%	10.0%	36.6%	20
Campsie	124	452	729	1,305	6%	21.8%	35.2%	21
Kirkintilloch	825	1,228	3,835	5,888	9%	13.5%	42.1%	21
Lenzie	423	597	1,825	2,845	10%	13.9%	42.5%	22
Milngavie	556	392	2,466	3,413	9%	6.6%	41.4%	19
Milton	89	271	673	1,033	5%	15.0%	37.3%	19
Torrance	96	116	570	782	9%	11.3%	55.3%	25
Twechar	60	141	113	314	10%	22.4%	18.0%	17
Waterside	52	117	135	304	4%	9.4%	10.8%	8
Totals	**5,232**	**5,399**	**19,667**	**30,298**				

The absolute heat demands and relative heat consumption bands for the properties in each Zone are given in Figure 12. The top graph shows the percentage of properties in each area where the total (absolute) heat demand in kWh/year is within each band. The lower graph shows the heat demand per square meter. This second (relative) measure reflects the energy efficiency of the property, regardless of its size.

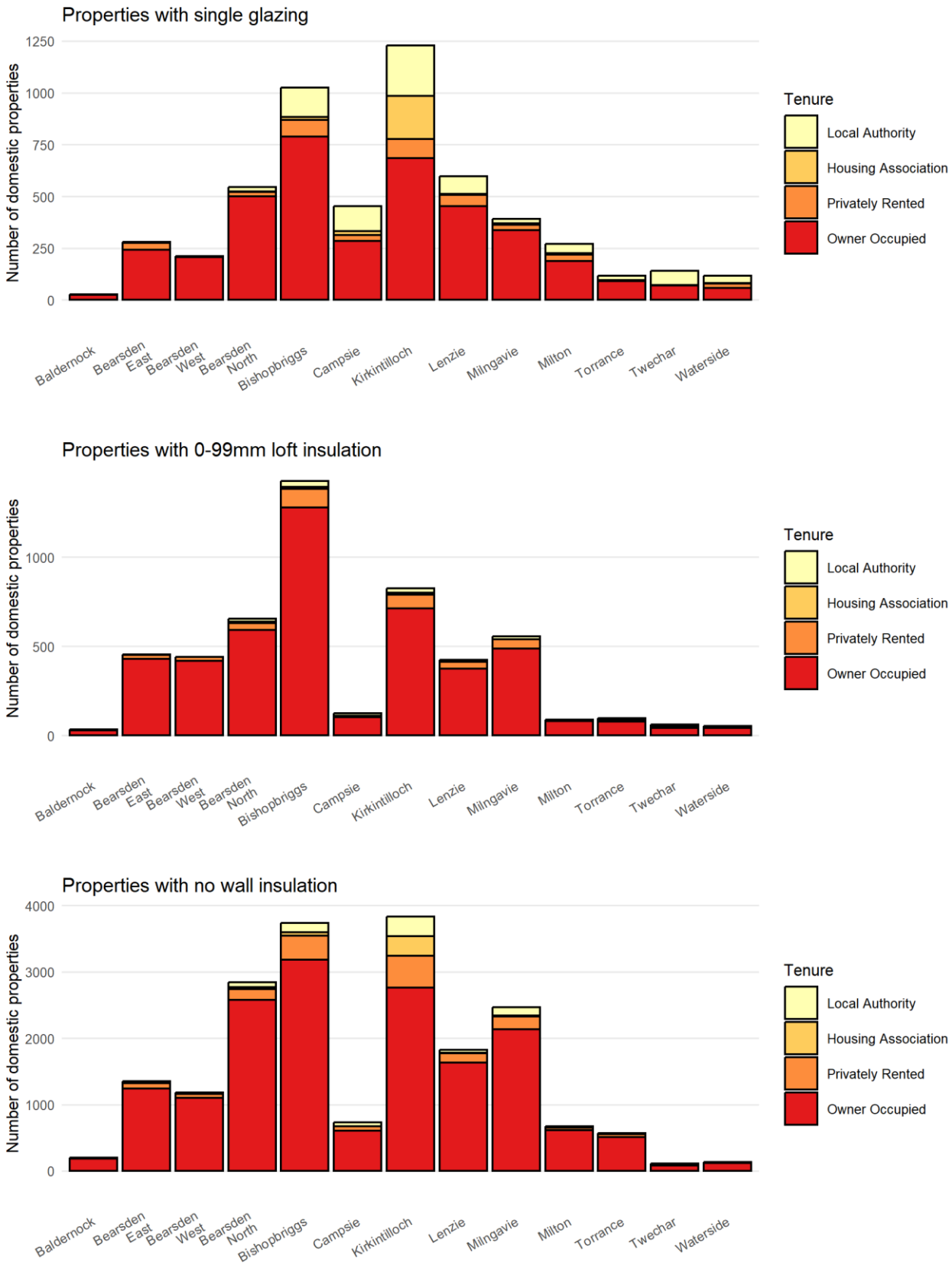
Figure 12: Absolute and relative energy demands of domestic properties by Strategic Zone



It is worth noting that a majority of the properties fall into higher demand categories, where Bishopbriggs, Kirkintilloch and Milngavie have the highest property counts falling in the >200 kWh/m^2/y band.

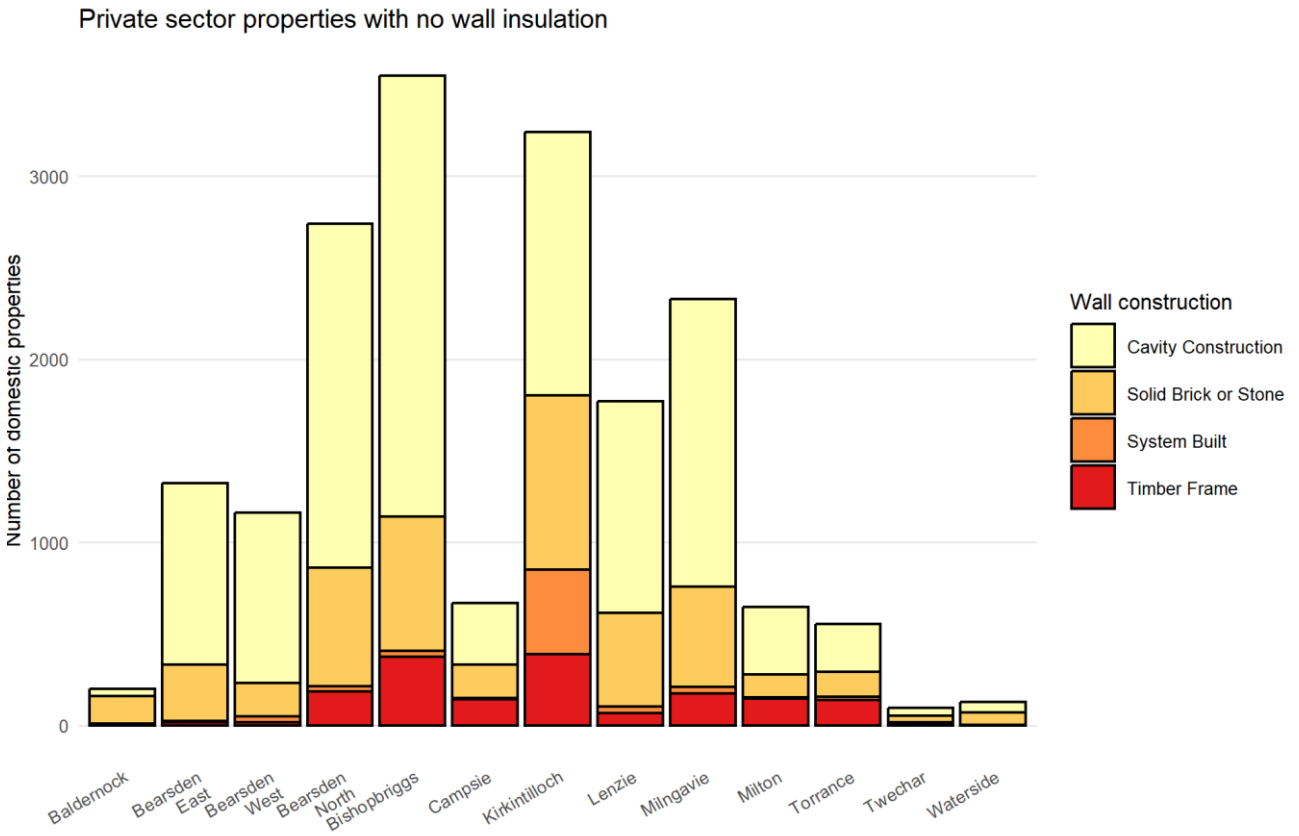
The three suggested interventions broken down by strategic zone and tenure are shown in Figure 13.

Figure 13: Domestic properties requiring upgrades to glazing, and loft and wall insulation



A large number of properties, almost exclusively in the private sector, are predicted to lack wall insulation based on the available data. A breakdown of the construction types in the private sector is shown in Figure 14 and it is evident that the majority of the properties lacking wall insulation have a cavity wall, which should be straightforward to insulate. However, this is not universal - Baldernock, where half of the properties are pre-1919 and lack wall insulation, are principally stone-built and are often challenging to insulate in a cost-effective manner.

Figure 14: Wall construction in privately rented and owner-occupied houses



The majority of properties flagged as being single-glazed and in need of upgrade to double-glazing are not in conservation areas, so there should not be significant barriers to upgrade (Figure 15).

Much of the Home Analytics data is implied from other observations (wall construction type, for example) where there is no direct observation of a feature (wall insulation, for example) and this may mislead. A target for the LHEES strategy must be to improve the quality of the data used for decision-making and this may be done in tandem with the Scottish Government to improve the Home Analytics dataset.

Figure 15: Properties flagged as single-glazed by conservation status

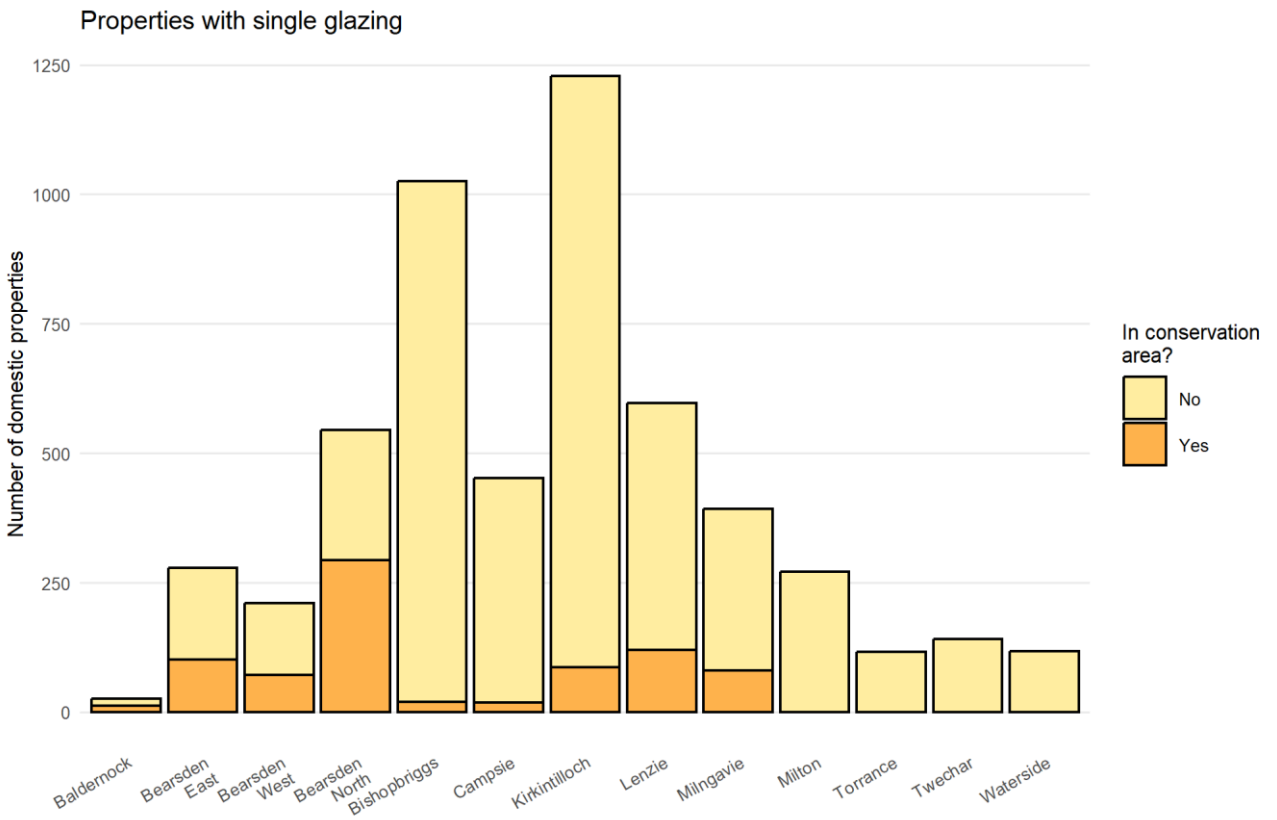


Table 7 shows the breakdown of the effect the energy efficiency interventions have on reducing energy demand across all the East Dunbartonshire building stock. For reference, the baseline heat demand per year for the domestic buildings in East Dunbartonshire Council is approximately 737 GWh. This data helps to identify which measures are the most effective ways to reduce heating demand, helping both fuel poverty and heat decarbonisation, and has been undertaken on a building-by-building approach based on the existing dataset.

Loft insulation upgrade is by far the most cost-effective method to reduce heating demands. On the other hand, installing external wall insulation on the outside of buildings that already have cavity or internal wall insulation is deemed the least cost-effective way to reduce heat demand. However, there may be other reasons for doing less cost-effective measures, such as funding streams being allocated only to specific measures, periodic refurbishments or improving the aesthetics of the building with external wall insulation or window upgrades.

Table 7: Summary of energy efficiency interventions across all buildings in East Dunbartonshire

Measure	Heat Demand Reduction (kWh/y)	Fuel Savings per Investment Cost (£/£)
Cavity Wall Insulation (CWI)	50,144,939	0.175
Internal Wall Insulation (IWI)	5,258,338	0.093
External Wall Insulation (where it is the only wall measure that can be applied)	13,880,426	0.063
External Wall Insulation (alongside CWI or IWI)	91,355,709	0.025
All wall insulation measures	**160,639,413**	**0.038**

Measure	Heat Demand Reduction (kWh/y)	Fuel Savings per Investment Cost (£/£)
Loft insulation upgrade from <100mm	21,607,824	0.699
Loft insulation upgrade from 100-250mm	39,189,822	0.417
Loft insulation upgrade from 250-300mm	22,191,954	0.168
All loft insulation measures	**82,989,600**	**0.325**
All Single to Double Glazing upgrade	**8,674,579**	**0.049**
Cylinder insulation upgrade from <50mm	11,475,045	0.201
Cylinder insulation upgrade from 50-80mm	2,159,424	0.109
All cylinder insulation measures	**13,634,469**	**0.177**
All Combined Measures	**265,938,061**	**0.057**

The fuel savings per investment cost is a metric similar to a financial payback. The inverse of this would provide something akin to a payback – the higher the fuel saving/investment cost the lower the simple payback would be. The actual payback for a particular dwelling depends on the fuel and fuel costs, and cost of measure (which is specific to each building, based on the building attributes).

7.5 Domestic Energy Efficiency and Fuel Poverty

The Weighted Scores for probability of fuel poverty as a results of poor energy efficiency, using the default weightings have been calculated for the Strategic Zones (Table 8). The default weightings (Appendix I) are:

	Default weighting
• Upgrade of single glazed windows to double glazing	16%
• Presence of uninsulated cavity walls	16%
• Loft insulation	17%
• Households in fuel poverty (fuel bill >10% of income after housing)	50%

These scores are driven in part by the energy efficiency indicators shown in Table 6 (50% of the weighting) and by, and the fuel poverty indicator (50%). The default weightings from the LHEES methodology were use, as described in Appendix I. For example, this default approach weights are based on Fuel Poverty rather than Extreme Fuel poverty as this was considered the most applicable approach to East Dunbartonshire, given the relatively lower levels of fuel poverty than the average for Scotland.

The connection between building energy efficiency and fuel poverty is not necessarily straightforward due to the inherent complexities of the latter. Baldernock, Campsie, Twechar, Kirkintilloch and Torrance stand out because, although energy efficiency is predicted to be reasonable, the risk of fuel poverty is higher. Among these zones, Twechar is an interesting example since it has the highest percentage of households in fuel poverty while 58% of properties have EPC ratings A-C (figure 10) and has received a low weighted score for energy efficiency measures needed (table 6). The better-performing buildings and an overall lower likelihood of fuel poverty in Waterside make this area the outlier (in a positive sense).

Table 8: Domestic fuel poverty scores by strategic zone

Strategic Zone	Estimated Households with energy bills > 10% of income after housing costs	Total Weighted Score
Baldernock	1.8%	15
Bearsden East	0.2%	12
Bearsden West	0.2%	11
Bearsden North	1.2%	11
Bishopbriggs	2.2%	11
Campsie	8.9%	15
Kirkintilloch	10.0%	16
Lenzie	2.4%	12
Milngavie	3.3%	11
Milton	2.6%	11
Torrance	2.9%	14
Twechar	14.5%	16
Waterside	4.2%	6

7.6 Heat Networking Opportunities

7.6.1 What is a heat network?

Heat networks distribute heat through pipes, from a source to multiple buildings which consume that heat. These networks can be developed at various scales, including district heating schemes which are strategic scale developments where multiple buildings are connected, smaller heat networks connecting several buildings within a single campus or boundary, or communal heating systems supplying multiple users within a single building. Part of the LHEES process is to identify suitable locations for district heat networks, but in East Dunbartonshire, we have also considered smaller networks between Council-owned properties.

The purpose of identifying suitable locations is to identify where a heat network with a zero-carbon energy source could be an efficient and expedient means to decarbonise the heat supply in a particular area. In addition to being practical, it must also deliver heat to the consumer at a reasonable price, and since they are likely to be developed by private finance, they need to be commercially viable propositions to attract private investments.

Defining a heat network:

A district heat network or communal heating system is considered a 'heat network' under the Heat Networks (Scotland) Act 2021. The act defines two types of heat networks:

- District heat network, which is described as

  "a network by which thermal energy is distributed from one or more sources of production to more than one building"; and

- Communal heating system, which is described as

  "a system by which thermal energy is distributed from one or more sources of production to one building comprising more than one building unit."

7.6.2 Approach

The principal parameters for determining areas where heat networks are feasible are the density of heat demand and the presence of one or more “anchor loads” (loads which are large, stable and likely to connect).

To assess the density of heat demand, Non-Domestic Analytics data, Home Analytics data and Scottish Heat Map data were merged and supplemented with data from the Council on fuel consumption within their estate. Since the former two sources of data have significant uncertainty associated with them, a data validation exercise was carried out to remove any duplicate points and replace demands which were evidently wrong (e.g., too large for the building size or type) with better estimates. Finally, building use types which, by experience, are less likely to enter into commercial heat agreements (some commercial sectors, where short-term leases will conflict against long-term heat connection requirements) were removed.

The cleaned data was mapped using the linear heat density method, which involves drawing a circular boundary around each building, the radius of which is proportional to the heat demand of the building. Where multiple circles overlap with each other, a heat network between those buildings may be considered to be economically viable and is worth closer examination. The proportionality factor is variable, but rules of thumb are used by the industry to give different degrees of certainty in different conditions. In this assessment, and according to the LHEES guidance, two factors were used:

- A baseline scenario (purple shades throughout this analysis) using **4,000 kWh/m/year** where the radius of the circle around each property is given by the heat demand (in kWh/y) is divided by 4,000, and
- A stringent scenario (green shades throughout this analysis) using **8,000 kWh/m/year**.

Any radius calculated to be greater than 250 m was clipped at 250 m, to avoid having areas dominated by single buildings. The mapping outputs are reflected in the following figures:

- Figure 16: Linear Heat Density – Baseline output; 4,000 kWh/m/year – All data points
- Figure 17: Linear Heat Density – Baseline output; 4,000 kWh/y/m – Cleaned dataset.
- Figure 18: Linear Heat Density – Stringent output; 8,000 kWh/m/year – Cleaned data.

The 4,000 kWh/m/year measure naturally results in more overlapping circles and, therefore, more areas suggested as being potentially suitable. The 8,000 kWh/m/year shows fewer areas, but those areas have a higher chance of forming a successful heat network since the opportunity to sell heat relative to the length of pipes to install is greater. The lower value reflects the economics of installation in places where it may be cheaper to excavate and the higher value reflects places with more hard surfaces and congested buried services.

Having mapped the circles, clusters of overlapping circles were examined to gauge the scale of potential networks. Since a network requires a heat source, an energy centre, thermal storage etc., there are certain fixed costs which require economies of scale to make financial sense. There is no fixed rule on a minimum size, however we have considered that a total heat demand of 15,000 MWh/y, would result in an energy centre of “meaningful” economic scale. This represents a 3MW heat source operating for 5,000 full load equivalent hours and is intended to represent a quantity of heat where it becomes viable to construct and operate an energy centre.

Annual heat demand data from non-domestic properties of a significant scale were gathered as part of this process to map the most realistic opportunities for heat networks. The NHS and HMP Low Moss Prison are two of the key public sector stakeholders engaged with (summary of the stakeholder engagement is available in Appendix H). This engagement was undertaken to explore opportunities for collaboration, including with EDC’s ongoing work (especially the development in Westerhill).

Although the Stobhill hospital campus is outwith East Dunbartonshire, it is close to the boundary and has a significant heat demand, with 3 gas supplies on site using a total of 18,300MWh of gas. The detail of which buildings are viable to connect and their respective loads could be considered within any future feasibility study. This was included in analysis to assist in characterising the potential for cross-boundary heat network opportunities within Glasgow City Region, however, the absence of a viable heat network zone opportunity on East Dunbartonshire’s side of the border in Bishopbriggs means there is not currently a basis to recommend further feasibility work. If the conditions become more favourable during the 5-year iteration period of the

LHEES, re-evaluation of a cross-border heat decarbonisation opportunity may lead to the conclusion that further feasibility work is warranted.

On an area-wide basis, moving from Figure 16 through to Figure 18 show that:

1. The heat networking opportunities throughout the EDC area are limited under current conditions.
2. Due to the filtering process, some of the areas identified in the first national assessment[53] are now no longer present. In particular, this relates to the area North of Bishopbriggs where the Harper Collins site is located (see section 7.6.4 on the Westerhill development).
3. It should be highlighted that the first national assessment covered all of Scotland and so the process of filtering out erroneous or spurious data was a key focus of this study. The results presented following the filtering process here represent a more accurate and up to date picture compared to the national assessment.
4. Potential areas of moderate heat demand density in Milngavie and Bishopbriggs have been removed from potential heat networking zones, however figures showing the stringent and baseline linear heat densities are presented in Appendix F for reference.
5. The areas with highest potential for heat networks are not adjacent to Council boundaries and do not therefore represent cross-border opportunities under current conditions.

[53] https://www.gov.scot/publications/first-national-assessment-potential-heat-network-zones/

Figure 16: Linear Heat Density – Baseline output; 4,000 kWh/m/year – All data points

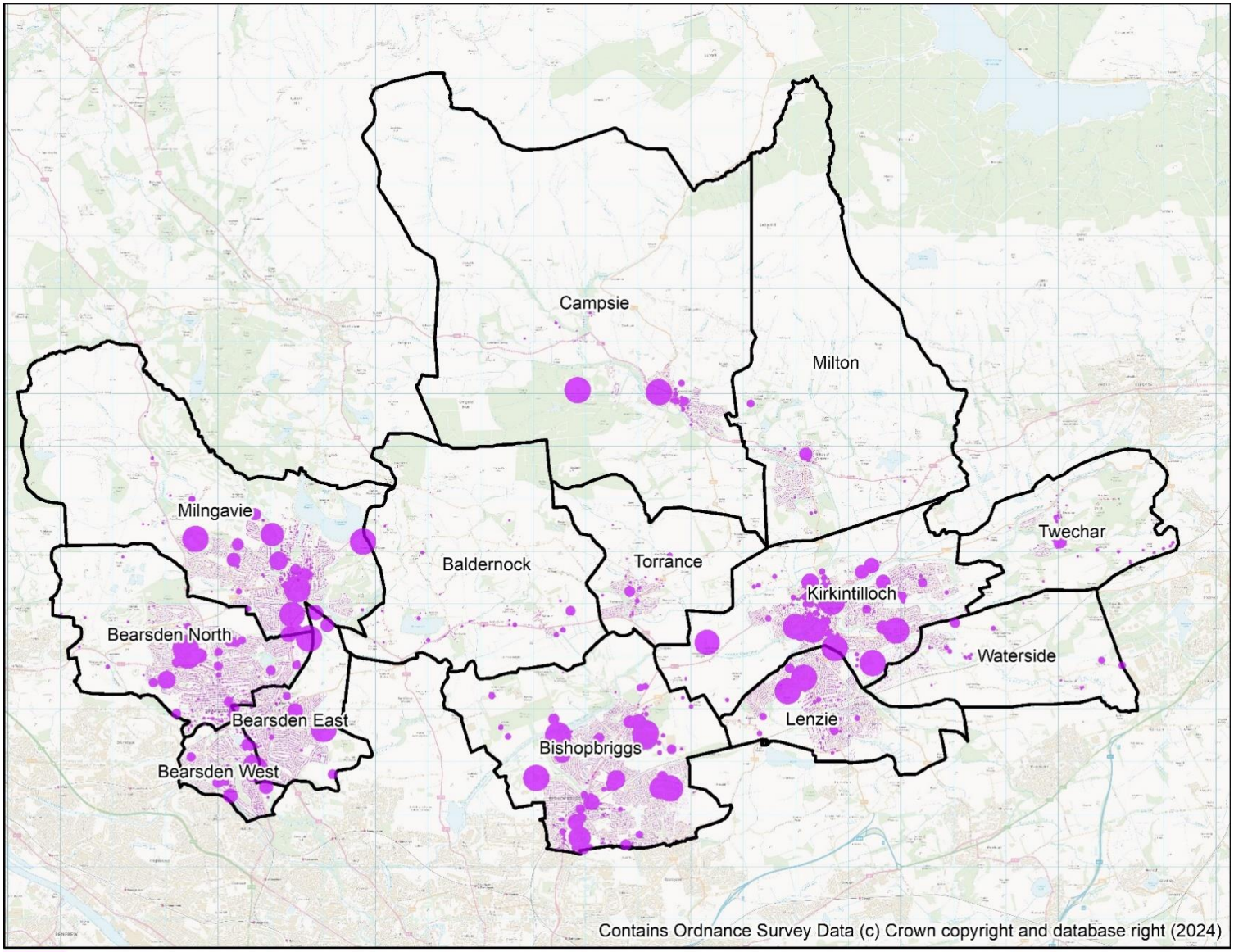


Figure 17: Linear Heat Density – Baseline output; 4,000 kWh/y/m – Cleaned dataset

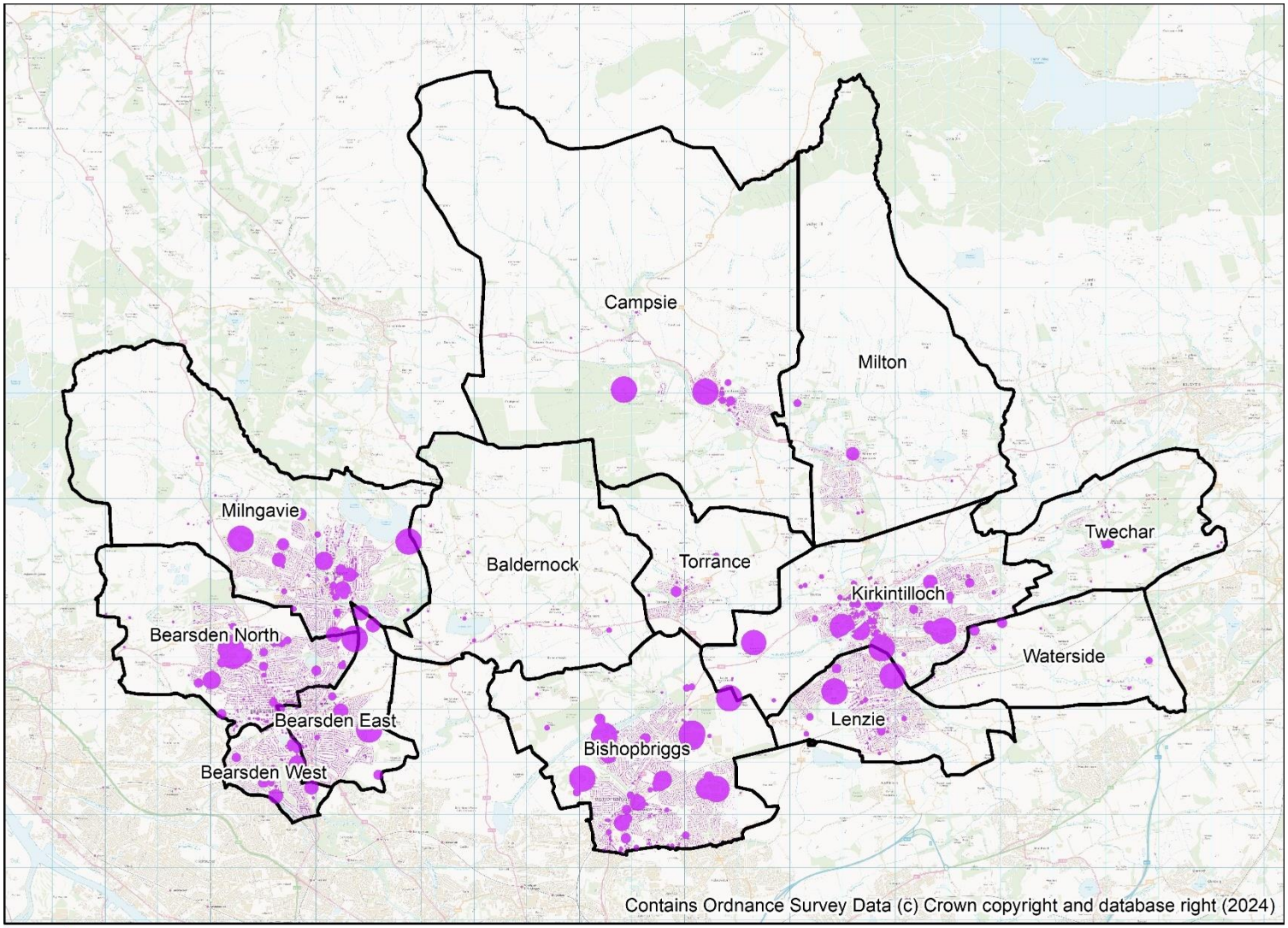
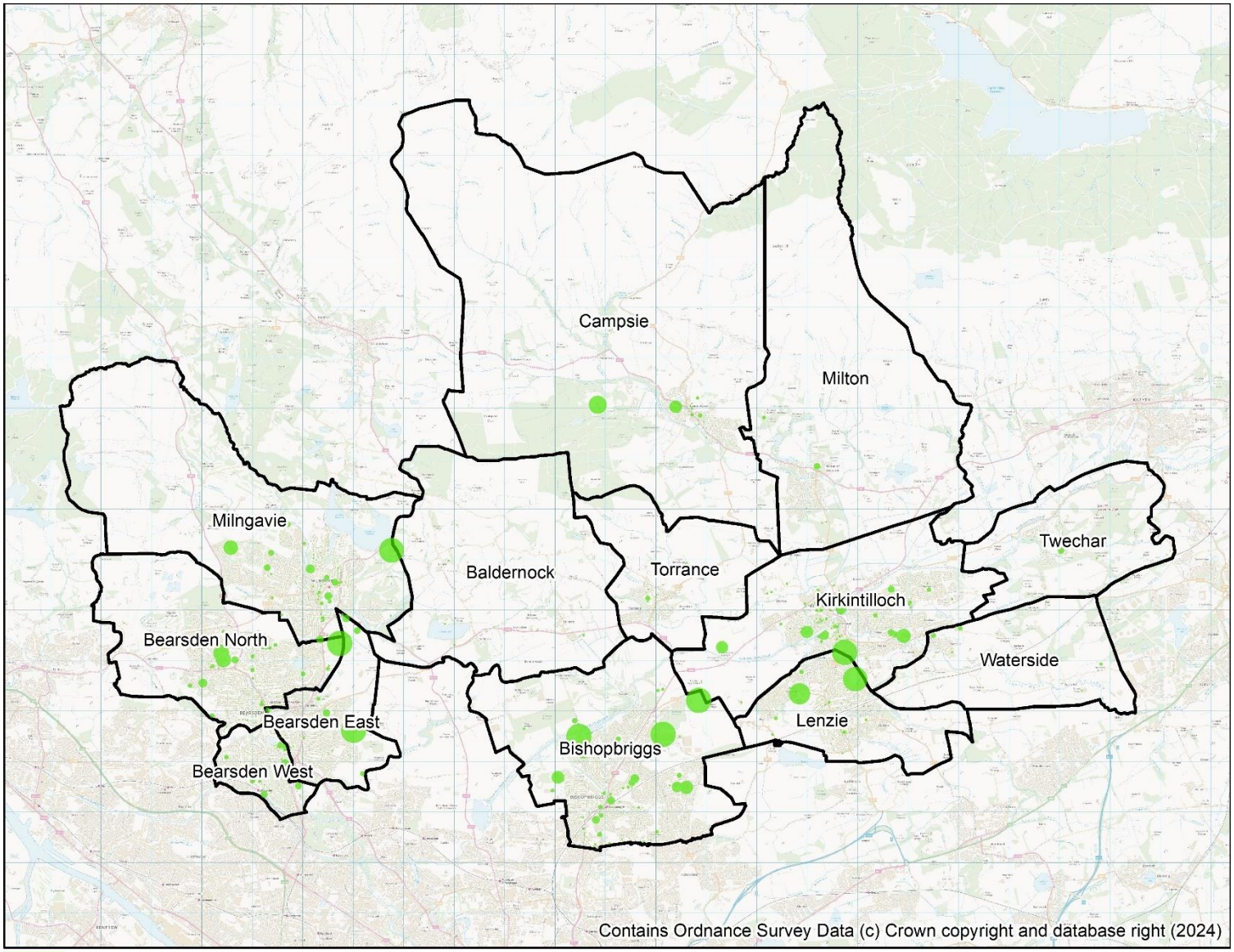


Figure 18: Linear Heat Density – Stringent output; 8,000 kWh/m/year – Cleaned dataset



7.6.3 Opportunities in Bearsden and Kirkintilloch

With the more lenient baseline assessment, East Dunbartonshire has **no individual cluster of demand greater than 10,000 MWh/y.**

The largest cluster is centred on Bearsden Academy and St Nicholas School with the inclusion of the surrounding care homes and sums to 9,800 MWh/y (Figure 19) and this remains with the 8,000kWh/m criterion too. This would be one way of decarbonising Council owned non-domestic properties.

Although not a contiguous cluster, the next area of interest is in the centre of Kirkintilloch west of the A806. This is centred on the Kirkintilloch Leisure Centre, Lairdsland Early Years Centre and the offices and clinics in that area but may extend north via Cowgate. If the 250 m clipping limit is removed, then the proposed Lenzie Academy site comes into the picture and the heat demand for the extended area rises to ~32,366 MWh/y. See Figure 20.

This area is worth study but there is a risk to consider. When the Academy is constructed, regulations are likely to require the inclusion of a low carbon heat source and that will likely happen before any network is developed. In that case, it would make some sense for the Council to consider supplying the leisure centre with heat from the new plant at the Academy. At that point, the remainder of the potential zone would be less attractive for commercialisation, as these loads would be considered critical to any network being developed in this area. Although highlighted as a zone to consider, Figure 20 shows that there are very few areas of dense heat demand (i.e., areas where there are overlapping circles on either the stringent or baseline classification) – the low-density housing that exists between the larger/anchor loads mean that the cost of implementing a heat network could be high. There are several branches of waste-water pipework that run either adjacent to, or through this proposed area – though no wastewater treatment plant in the vicinity to make this a viable option for sourcing heat.

Figure 19: Heat demand density cluster around Bearsden Academy

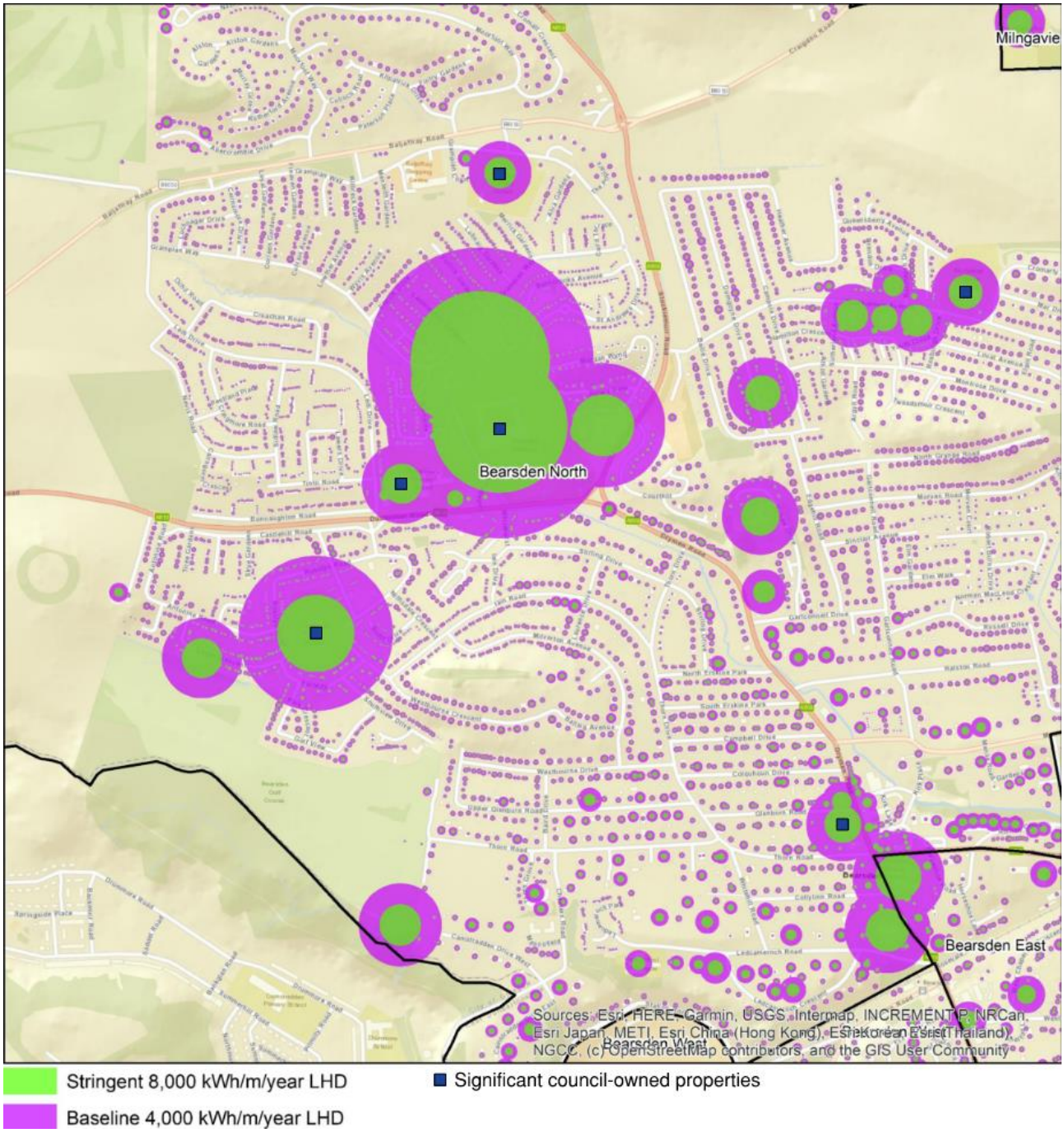
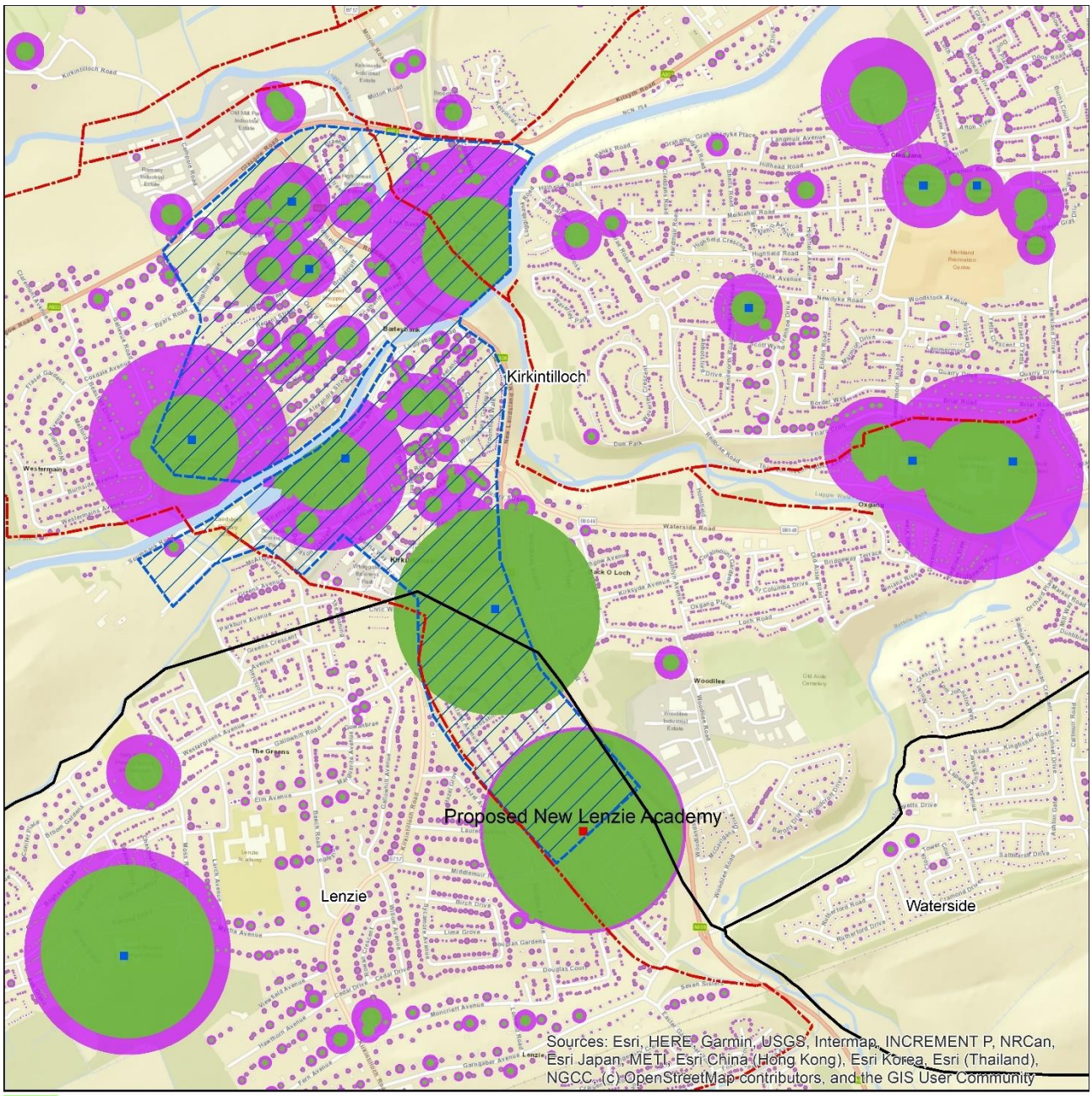


Figure 20: Heat demand density in Kirkintilloch. Note the small zone to the east of the figure is Kirkintilloch High School, see Figure 23



7.6.4 Westerhill development

The Westerhill Regeneration Area Framework Masterplan[54] (policy 3.R of EDC's Local Development Plan 2) plans for new-build and refurbishment or demolition of existing buildings around HMP Low Moss and the Harper Collins site at Westerhill. Assuming that the development is predominantly offices and light industrial, then the heat demand of the proposed development and the prison might total in the region of just 5,000 MWh/y, based on them being built to current standards. There may also be a cooling load in some of these buildings depending upon their use.

Modern buildings, with both heating and cooling demands can be suited to ambient-temperature networks where each building has a heat pump that extracts heat from the network in heating mode or rejects heat to it in cooling mode, often referred to as a 5th generation heat network. Since it is not necessary to insulate pipes in such a network, they can be lower in cost to install, particularly if they can be installed as part of the infrastructure development. This may overcome the lack of heat demand density.

However, if the development happens over a long period (the proposal currently estimates 10 years) then a heat network would require a large up-front investment to develop an energy centre and the required infrastructure may be required before customers are in place. In this case, individual low carbon heat sources (as outlined in Table 3: Heat Decarbonisation Interventions) serving each building may be preferred.

As the planning of the development progresses, the requirement for a detailed feasibility study should be included. It may also be worth encouraging heat producers, like data centres, as well as heat consumers to locate in the development.

7.6.5 Council campus networks

There are great opportunities for East Dunbartonshire to utilise small networks as solutions to their own building decarbonisation challenges.

There are multiple examples of pairs of secondary and primary schools which are close together and could be served by small district heating network based on heat pumps. These include:

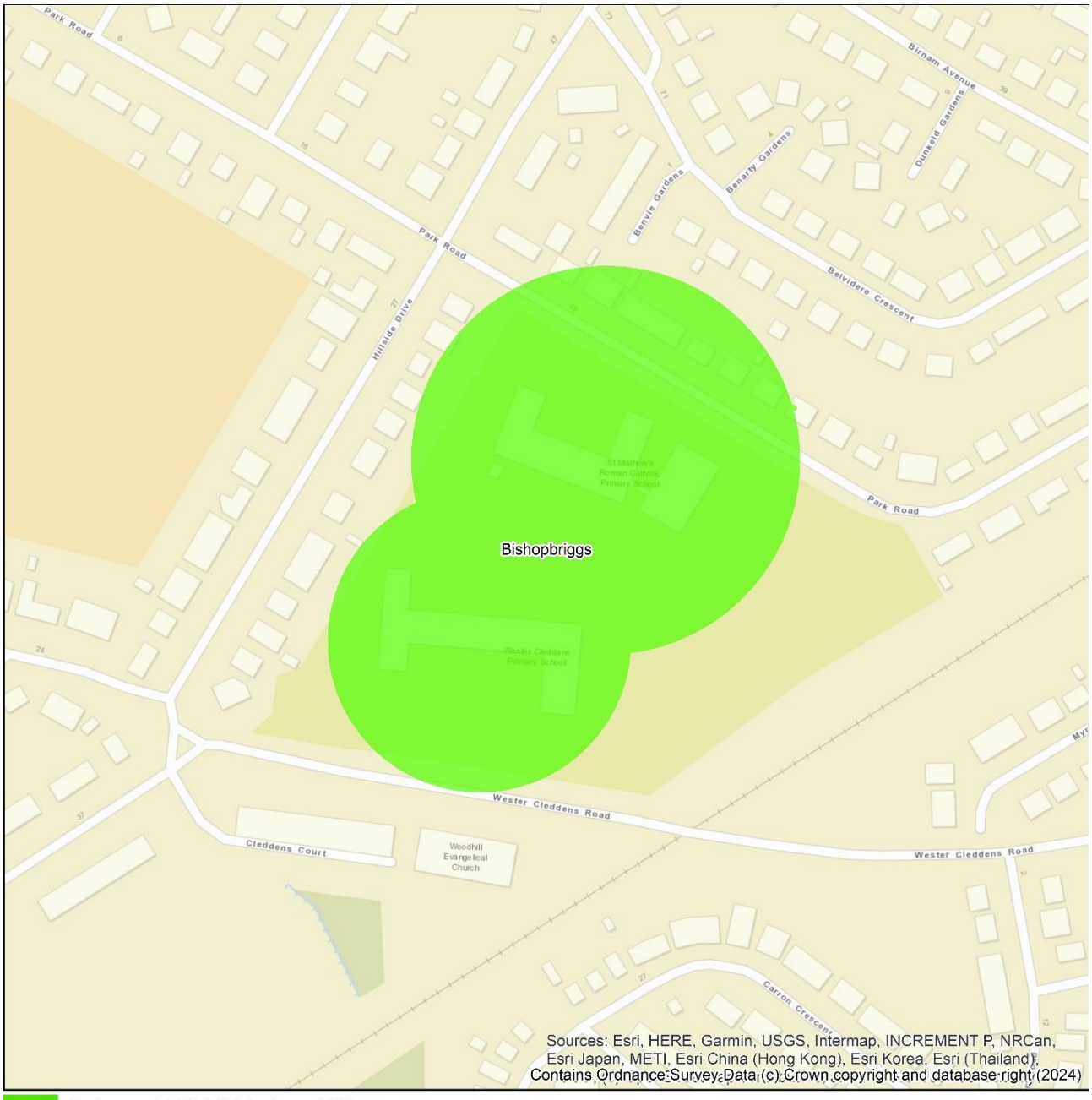
- Bishopbriggs Academy / Thomas Muir Primary School / St Helen's Primary School (Figure 21).
- St Matthew's Primary School / Wester Cleddens Primary School (Figure 22).
- Kirkintilloch High School / Oxgang Primary School (Figure 23).
    - Note this potential system also appears on the east-side of Figure 20.

[54] Westerhill Regeneration Area Framework Masterplan | East Dunbartonshire Council

Figure 21: Example of opportunity for small scale district heating system for schools- Bishopbriggs Academy, Thomas Muir Primary School and St Helen's Primary School

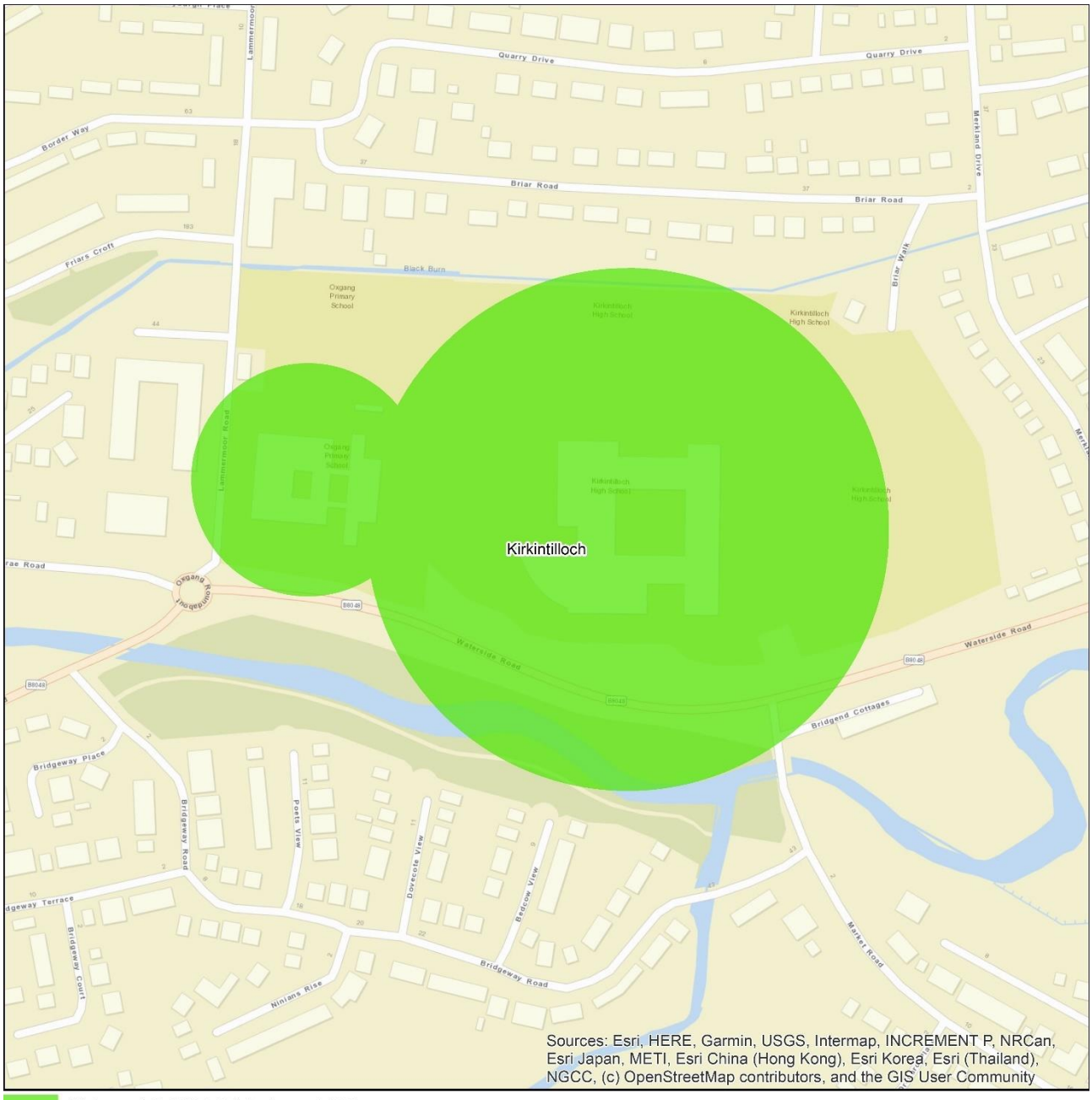
Stringent 8,000 kWh/m/year LHD

Figure 22: Example of opportunity for small scale district heating system for schools- St Matthews Primary School and Wester Cleddens Primary School



Stringent 8,000 kWh/m/year LHD

Figure 23: Example of opportunity for small scale district heating system for schools- Kirkintilloch High School and Oxgang Primary School



7.6.6 Source of heat for a heat network

The source of heat used for a heat network will impact the heat sale price, using cheap/free available sources of heat can help to drive the cost of heat down. A default position of using air as the source in an air source heat pump is a viable option, but other sources of heat could result in higher efficiencies (but at much higher upfront capital costs). The source of heat must be near to the heat demand/network zone to keep these costs down. Potential sources of heat could be:

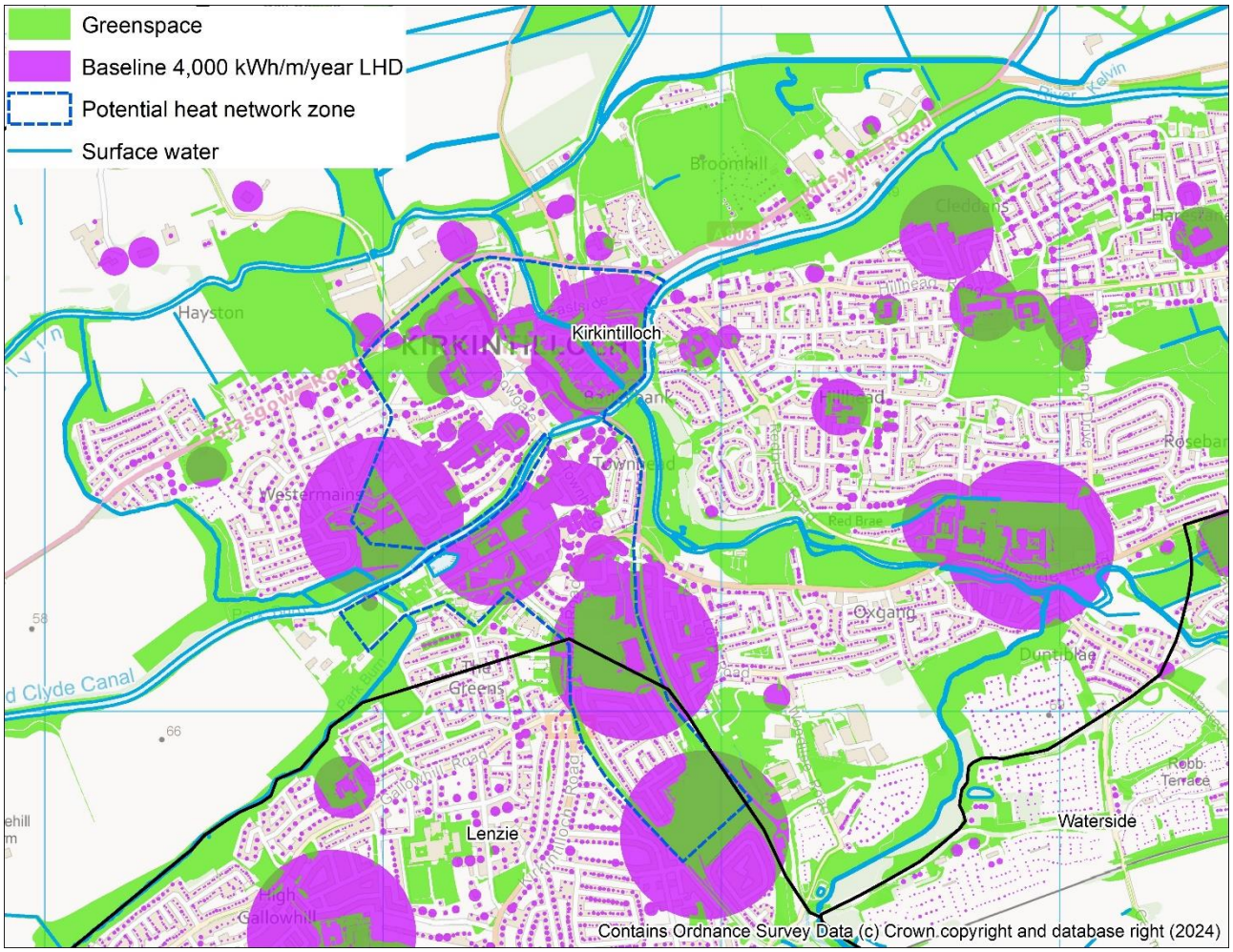
- Energy from waste.
    - No available sources.
- Wastewater heat pump system.
    - Data from Scottish Water Horizons was referred to consider wastewater heat extraction opportunities, especially for a possible heat network in Kirkintilloch. However, no viable water

treatment sites or sewerage pipework are currently available in close enough proximity to areas of demand.

- Ground source heat pump using shallow boreholes up to a depth of 200m, or geothermal energy at depths of 500 - 2,500 m.
    - A very expensive option and could be problematic in built-up/urban areas. However, if being pursued, they could be implemented at the construction stage of a development to keep costs as low as possible.

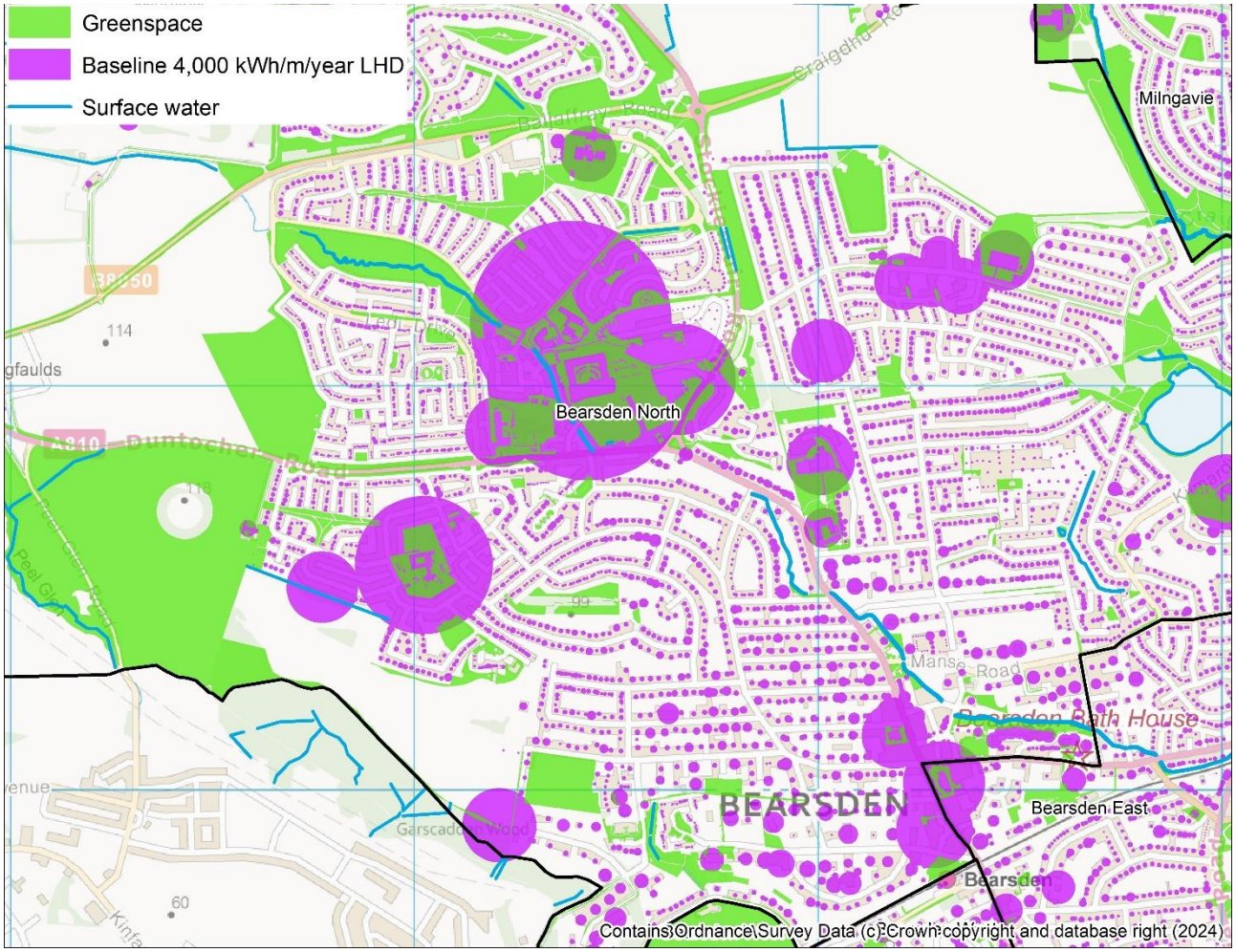
When the potential heat network zone in Kirkintilloch is considered against the Green Spaces and surface water available as shown in Figure 24, it can be seen that there are a significant number of Green Spaces within Kirkintilloch which could be considered as part of any future feasibility study. The map also shows surface water sources, however a pre-feasibility study conducted in 2018 revealed there are limitations due to the flow rate through the Forth & Clyde Canal, which eliminates this as a viable source at this stage.

Figure 24 Green Spaces and surface water in Kirkintilloch



The green space in Bearsden is shown for reference in Figure 25 Bearsden Green Space for the area discussed in section 7.6.3.

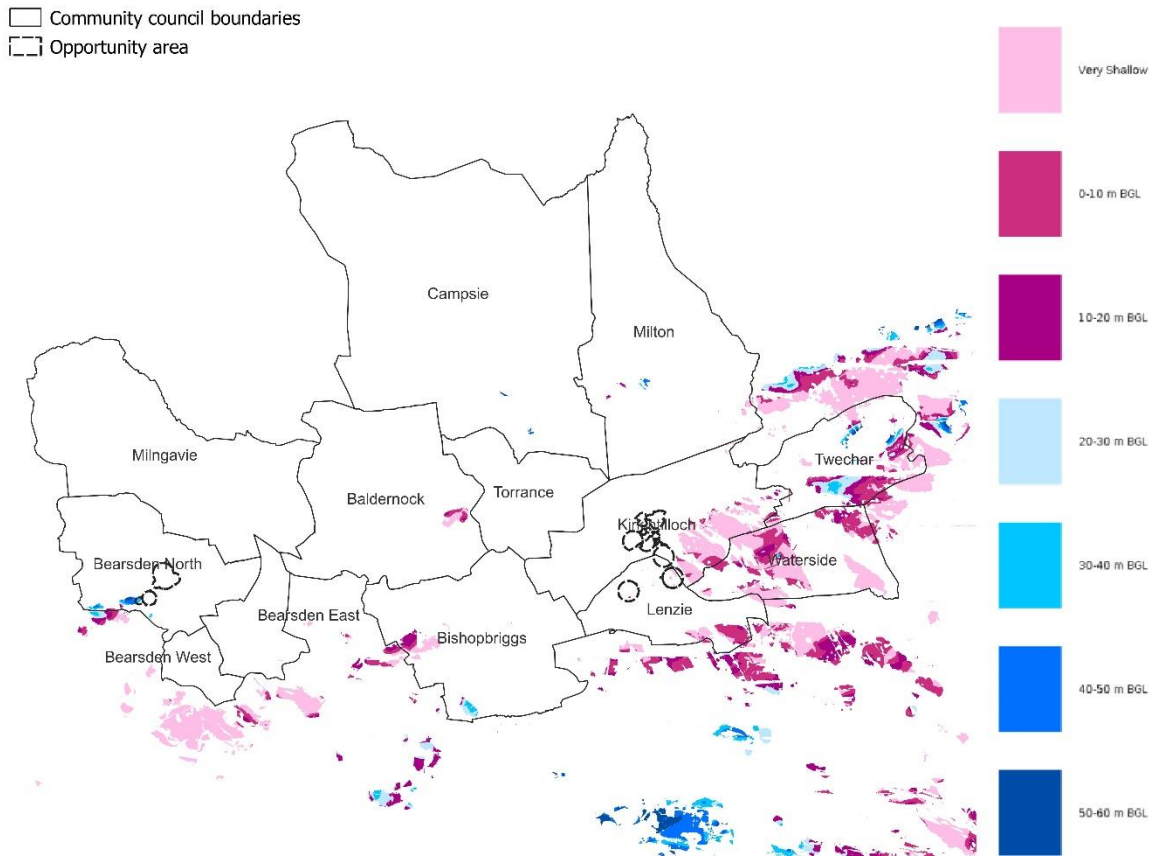
Figure 25 Bearsden Green Spaces



As can be seen from Figure 26 there are mines in several strategic zones. There is minimal overlap between potential heat network areas and these mines, especially around Kirkintilloch. Some opportunity areas in Bearsden North, areas bordering Bishopbriggs and Glasgow, and Twechar may present opportunities for extracting geothermal energy for local low carbon heating solutions and could warrant further studies. However, the costs for extracting mine water from deepened boreholes, installing the pipework and heat pumps should be weighed against the scalability of the opportunity. Under current conditions these mines are

anticipated to be flooded, but they could be considered as part of any feasibility study to determine the possibility to support heat decarbonisation.

Figure 26: Mine water Geothermal Resource Map



Options for sourcing renewable electricity from existing installations, particularly wind farms or solar PV farms, could be considered as part of a heat network feasibility study where relevant, to keep the cost of electricity for heat pump solutions as low as practicable.

7.6.7 Next steps

A feasibility which includes stakeholder engagement, verification of building loads and an outline assessment of heat sources and pipe routes could be commissioned for the Kirkintilloch potential zone.

Building Assessment Reports and Heat Decarbonisation Plans should be completed for the Council-owned properties noted above to confirm the feasibility of communal networks as decarbonisation solutions.

7.6.7.1 Potential funding routes

Engagement with interested heat network operators and the Scottish Government may generate financial support for this exercise. While funding is subject to availability and their operating cycles, there is a wide range of options targeting the private sector (homeowners, landlords and businesses), public sector (including local authorities) and the third sector (refer to Appendix M for a more extensive list of funding opportunities currently available). There are various funding mechanisms currently available:

- **Scotland's Heat Network Fund**: This primary funding source provides £300 million over the current parliamentary session. It supports the development of new zero-emission heat networks and the expansion or decarbonization of existing ones. The fund offers capital grants to both public and private sector projects that can demonstrate significant contributions to reducing greenhouse gas emissions.
- **Heat Network Support Unit (HNSU)**: This unit offers tailored advisory services and technical support for the development of heat network projects. It helps with feasibility studies, business cases, and navigating regulatory frameworks.

- **Local Energy Scotland**: Through the CARES (Community and Renewable Energy Scheme) program, it provides financial support and advice to community groups and organizations looking to develop or invest in local energy projects, including heat networks.
- **Private Sector Investment**: In addition to government funds, private sector investments and partnerships are encouraged to supplement public funding.

7.7 Low carbon heat – other technologies

There are a range of other low carbon heating technologies which may be suitable and are discussed below. Note that communal heating systems are classed as a 'heat network' within the Heat Networks (Scotland) Act 2021. However, we have included opportunities for uptake and decarbonisation of communal heating systems within this section, to elaborate on alternative heat sources and technologies that suit East Dunbartonshire.

7.7.1 Low carbon heating technologies

A list of technologies is outlined in Table 3, section 4.2.

Each property owner will make decisions on the technology which is suitable for their property. This analysis seeks to predict what will be found to be the most suitable technology and for which property. While heat pumps are likely to be the most suitable heating system (7.7.2.1), technologies such as electric heating and biomass will be appropriate to some specific properties and other technologies such as hydrogen should not be ruled out entirely at this stage, as they may have a role to play in future LHEES iterations.

7.7.2 Individual or communal heat pump systems

It is possible for a single dwelling to have its own heating system, for a whole building that is made up of multiple properties to have a single heat pump system (communal heat pump system) or for many buildings to be connected together into a distinct heat network as referenced in section 7.6. This Strategy considers communal heat pump systems and individual heat pump systems in the same category. The count of communal systems within the strategic zones and shown in 7.7.2.1

In practice, whether it is practical to install an air source or ground source heat pump in a building depends upon a number of site-specific factors including available space, noise, visual impact and other planning restrictions. Conversely for a communal system to be installed the agreement of multiple property owners may be required, which is complex.

Similarly, each property owner can decide to make their own compromises between installation cost, disruption and operating cost. It is usually possible to achieve lower operating costs by using larger radiators. For the purpose of this Strategy a property has been deemed suitable for an individual or communal heat pump system if it is likely to be possible to achieve a good operating efficiency[55].

Higher temperature heat pumps can remove some practical limitations, such as by serving a shared heating/ hot water system which avoids each property needing a hot water cylinder. However, there is a trade-off as they have lower efficiencies (lower COP) and therefore are considered as one of a number of alternative solutions which we have grouped together as "other".

[55] The energy used by a heat pump depends upon the coefficient of performance which is related to the water temperature in the heating system at design conditions. Designing heating systems at lower water temperatures allows higher COP when providing space heating but requires larger radiators. The criteria chosen is intended to be such that a heat pump could be installed and be expected to achieve a COP of 3, however confirming this for an individual property would require a detailed calculation at design stage.

7.7.2.1 Communal Systems

Using the base data available, Table 9 shows the existing communal systems in the strategic zones. This shows the number of dwellings and systems that are either wholly owned by the Local Authority or by a Housing Association. This is because both owner types could influence the decisions on whether or not a communal system is installed in their properties.

Note that the table does not show where there are multiple tenancy types within a building. Having multiple tenancies within a single building does not mean a communal heating system could be installed, rather it would be more complicated to initiate, fund and maintain.

Table 9: Existing communal Systems in Local Authority owned buildings and Housing Association owned buildings

Strategic zone	Local Authority Owned		Housing Association Owned	
	Count of communal systems	Count of dwellings in communal building	Count of communal systems	Count of dwellings in communal building
Baldernock	0	0	0	0
Bearsden East	0	0	0	0
Bearsden North	17	136	1	33
Bearsden West	8	46	0	0
Bishopbriggs	34	101	32	131
Campsie	23	57	3	12
Kirkintilloch	42	199	90	321
Lenzie	14	106	0	0
Milngavie	23	91	7	23
Milton	4	8	1	2
Torrance	4	8	3	19
Twechar	27	57	0	0
Waterside	15	43	0	0

As shown in Table 9, there are 211 Local Authority owned communal systems that serve a total of 852 properties and 137 Housing Association owned systems that serve 541 properties. It is unlikely that these communal heating systems are currently decarbonised, so these currently represent opportunities to decarbonise multiple dwellings, if the communal heating system itself was decarbonised.

7.7.3 Assessing suitability for heat pumps in homes

This section estimates how many domestic properties in East Dunbartonshire would be suitable for heat pumps, either immediately, or after fabric improvements. This is a high-level assessment based on the information available in the Home Analytics dataset and every property would have to have a more detailed, individual assessment to confirm if it was indeed suitable, though there is not an agreed benchmark for assessing the suitability of each property for heat pumps in domestic properties.

Properties suitable without further upgrades

In theory, the limiting factor as to whether a low temperature heat pump could be used for space heating is a sufficiency of space to have radiators which are big enough to heat each room at the low radiator temperatures

desired for efficient heat pump operation. The DESNZ Electrification of Heat Demonstration project[56] report, conducted by Energy Systems Catapult, concluded:

"The project has not identified any particular type or age of property that cannot have a successful heat pump installation. The suggestion that there are particular home archetypes in Britain that are "unsuitable" for heat pumps is not supported by project experience and data."[57]

However, in practice, properties with high heat demand per square metre (i.e., low energy efficiency) are more likely to be challenging to install a low temperature heat pump and achieve adequate operating costs. High temperature heat pumps can be used **but have higher running costs than low temperature heat pumps**.

For the purposes of this Strategy the first criterion for the suitability of optimally-efficient individual heat pumps is that the property must have a predicted heat demand per floor area of less than 160 kWh/year/m². which equates to approximately 3 W/m²/K and 2,200 heating degree days; or approximately 75 W/m² of peak heat demand. In reality, this is conservative and some homes which do not meet this criterion do already have heat pumps installed, highlighting their flexibility, even if it is difficult to get a low cost of heat with such systems.

The second criterion relates to power supply. Domestic heat pumps are typically limited to 15 kW thermal power in a single unit on single phase electricity, which will equate to approximately 35,000 kWh/y of heat demand. Taking both criteria together, over half of the domestic properties in East Dunbartonshire **are already suitable for heat pumps without fabric interventions** (see Table 10).

Modelling the effect of interventions on the domestic stock, highlights how many further homes can be made suitable for heat pumps after either limited, cost-effective fabric interventions or after all possible fabric improvements. Note that the energy efficiency interventions that could be included, including the "cost effectiveness" are those listed in Table 7.

Table 10 indicates that today, **without any fabric upgrades**, 27,272 homes, more than half of those in East Dunbartonshire, **could be successfully heated with an air source heat pump**. After basic fabric improvements, this number rises to 43,224 homes and, if all possible measures identified in the analysis were implemented, this would be 45,841 of the 48,501 homes in East Dunbartonshire.

Table 10: Heat Pump Suitability

Heat Pump Suitability	Current baseline suitability	After cost effective energy efficiency measures to reach <160kWh/m²/y	After further energy efficiency measures to reach <160kWh/m²/y
Homes in East Dunbartonshire	48,501	48,501	48,501
Homes with relative heat demand <160kWh/m²/y	27,389	43,371	45,967
Homes with total heat demand <35,000kWh/y	47,610	48,178	48,245
Homes with combined relative and total heat demand <160kWh/m²/y and <35,000kWh/y	27,272	43,223	45,841

[56] Electrification of Heat Demonstration Project: winning bids, case studies and project data - GOV.UK (www.gov.uk)
[57] All housing types are suitable for heat pumps, finds Electrification of Heat project - Energy Systems Catapult

Other factors limiting suitability

There are other challenges with locating heat pumps, such as finding a suitable location for external units on the outside of buildings (which can be particularly challenging on specific archetypes (i.e., 4-in-a-block types))/ or finding suitable locations for hot water cylinders in properties without cylinders.

There are a number of types of heat pumps available, including air, ground, water source heat pumps, shared loop heat pumps, also known as 5th generation heat networks, as well as those which distribute heat through water-based heating systems and those which heat air directly. While most installations are currently air-to-water heat pumps, other types of heat pumps could be chosen, and this Strategy does not determine which type of heat pump is the most viable for individual buildings. Shared loop heat pump systems and larger heat pump systems distributing heat through a communal heating system in a building can be more suitable for flats, where locating a heat pump and hot water cylinder in or on each property is challenging.

Hard to treat properties which already have heat pumps

While this Strategy considers properties likely to be suitable for a heat pump based on the criteria above, properties which do not meet these criteria may still be suitable for a heat pump system. However, the challenges involved in designing and installing the system will be greater and the costs of doing so are likely to be higher.

There are 44 properties which already have a heat pump and have a heat demand over 160 kWh/m² (there are 408 properties with heat pumps today). This suggests that there are properties which have solved the problems associated with designing and installing heat pumps. There may therefore be an opportunity to both learn from these installations, and other heat pump installations throughout Scotland to increase the number or properties considered suitable in future iterations of this Strategy.

Solutions for the remainder

For those homes which do not fit the criteria modelled here and which do not, after individual assessment, suit a single-phase, air-to-water heat pump like those noted above, other solutions are required. These might include:

- A three-phase supply for an air-water heat pump
- Air-to-air heat pump(s)
- Retrofit the whole house with mechanical ventilation including heat recovery and heat pump
- District heating network connection
- Communal heating network connection
- Direct electric heating
- Storage electric heating

Each of these buildings would need advice from a competent person on the options available for that property and the benefits/limitations of each option.

7.8 Mixed Tenure, Mixed Use and Historic

Listed buildings can be challenging with respect to energy efficiency improvements, the siting of air source heat pumps external to the building, and the connection to new district heating pipework.

There are around 250 listed domestic properties (data for non-domestic is not available) in East Dunbartonshire. Only 19 % have EPCs rated C or better, with 9 % being F or G. This is less favourable than a typical domestic property but not extreme.

As with listed buildings, conservation areas represent a particular challenge regarding the introduction of energy efficiency measures and low carbon heat measures. For example, conservation areas are excluded from certain permitted development rights, which can result in properties requiring permission for works that may not have required planning permission if located in a different area. Conservation areas are also more likely to include traditional building types. Energy efficiency measures and low carbon heat sources tend to be more time consuming, challenging or costly to install, if they are possible at all.

The energy efficiency intervention data in Figure 13 has been revisited with a focus on properties in conservation areas (Figure 27).

Figure 27: Conservation area properties requiring upgrades to glazing, and loft and wall insulation

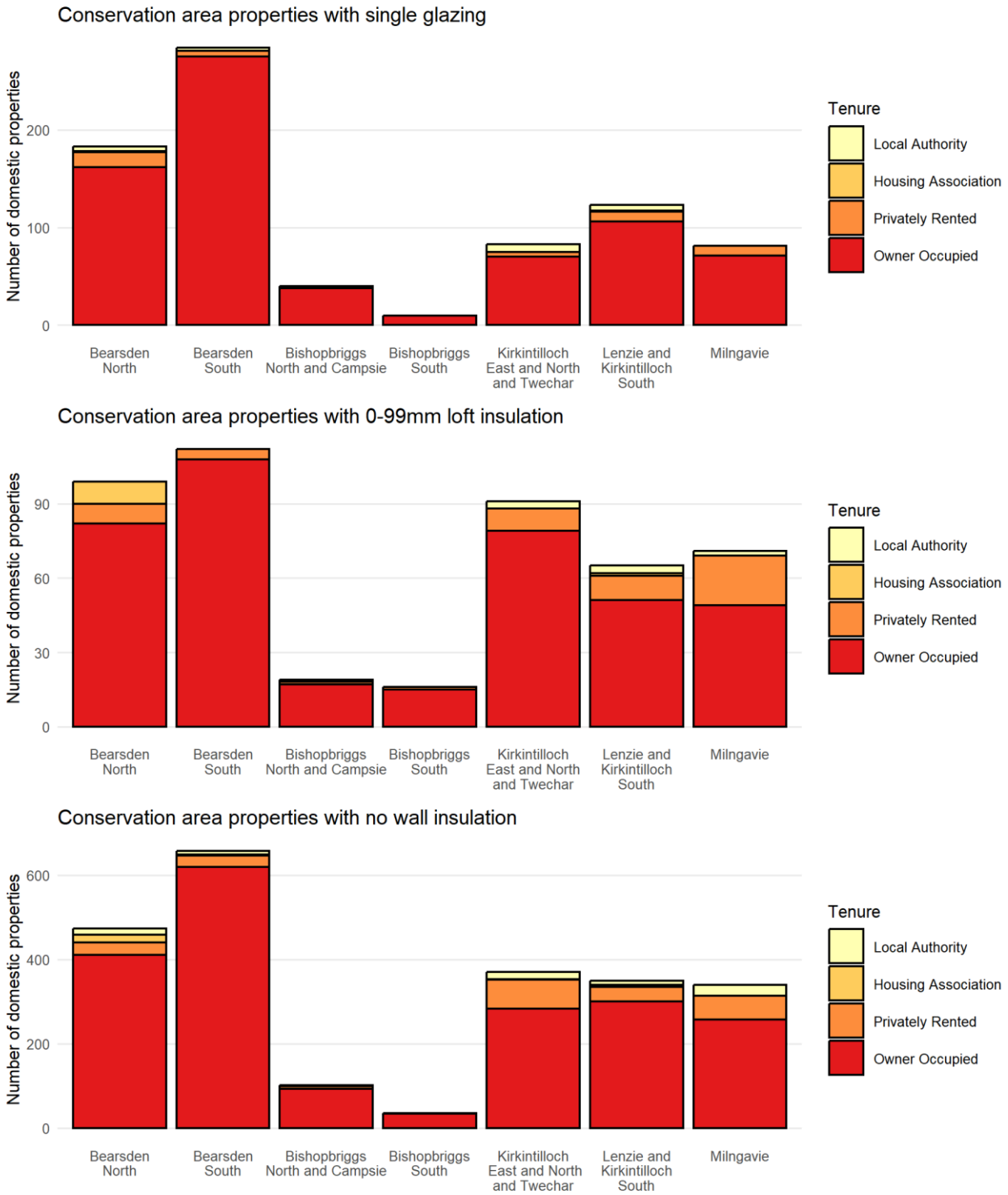
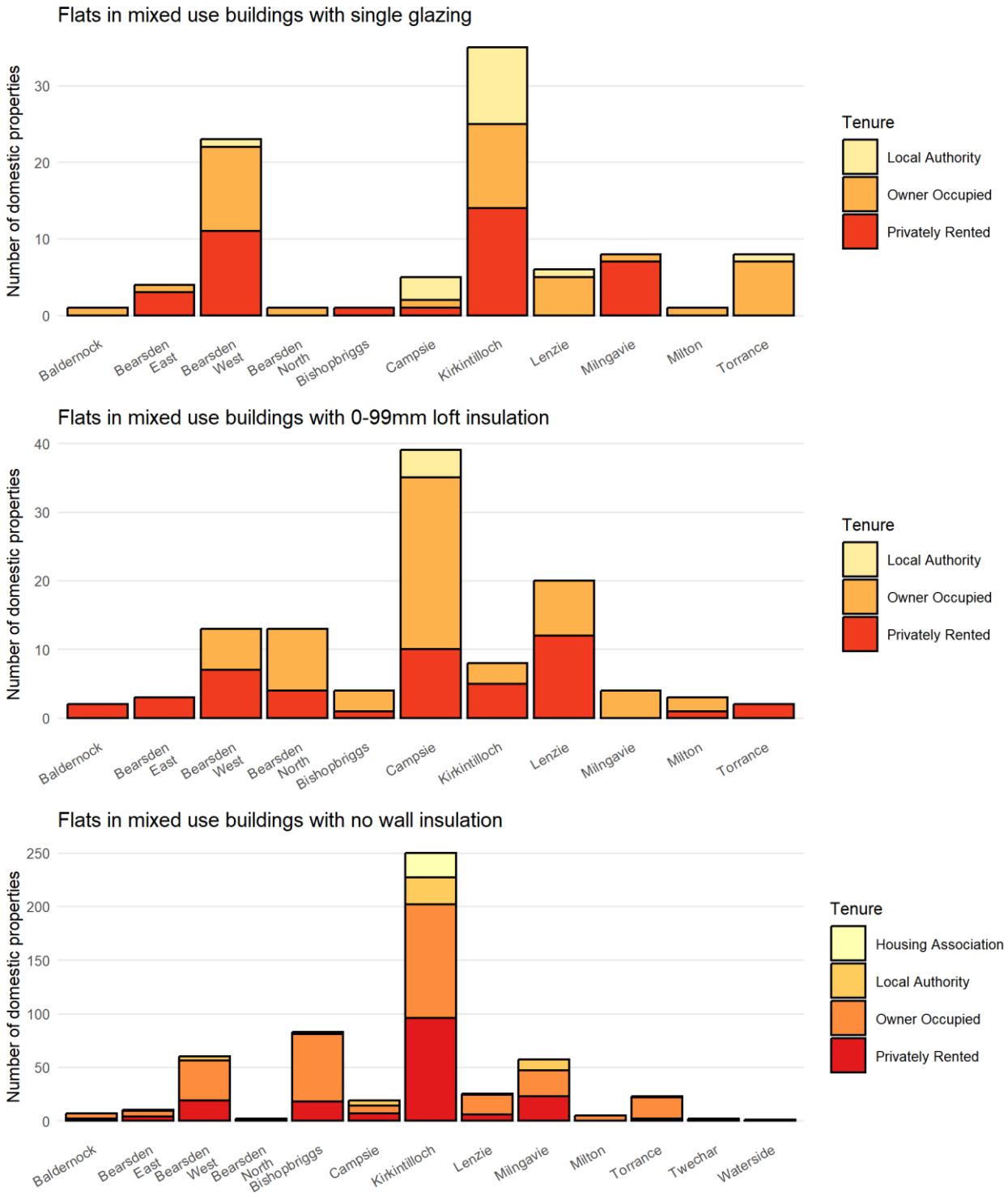


Figure 27 shows that the majority of properties in conservation areas are owner occupied, with a high prevalence of single glazing and no wall insulation, as expected. Historic Environment Scotland recognises the challenges in pursuing a fabric first approach with traditional buildings, with the skills required for retrofits and repairs, and the need for careful consideration when assessing decarbonisation potential.[58]

[58] Publication | The Engine Shed | Part of Historic Environment Scotland

The potential energy efficiency interventions for mixed-use properties are laid out in Figure 28 which shows that privately rented and owner-occupied properties require a majority of building fabric improvements for energy efficiency.

Figure 28: Domestic properties in mixed use buildings requiring upgrades to glazing, and loft and wall insulation



7.9 Building-Level Heat Decarbonisation

Table 11 summarises how many homes could be decarbonised by either heat networks or heat pumps in each Strategic Zone according to the analysis described in 7.6 and 7.7. Note that the suitability for a heat pump comes from Table 10, i.e., it is the 45,841 properties after any required fabric upgrades have been implemented.

Table 11: Impact of measures on domestic buildings by Strategic Zone

	Homes	Current Heat Demand (kWh/y)	Potential Heat Network Properties	Suitable for a Heat Pump	Not Suitable for a Heat Network or Heat Pump and Not Using Biomass	Not suitable for Heat Network or Heat Pump (%)
Baldernock	293	7,700,000	-	226	67	23%
Bearsden East	2,852	60,500,000	-	2,687	165	6%
Bearsden West	6,177	110,700,000	-	5,861	316	5%
Bearsden North	2,825	45,800,000	-	2,720	105	4%
Bishopbriggs	10,218	145,000,000	-	9,827	391	4%
Campsie	2,073	26,300,000	-	2,001	72	3%
Kirkintilloch	9,109	111,000,000	1,744	8,438	313	3%
Lenzie	4,293	72,200,000	258	3,985	300	7%
Milngavie	5,953	95,800,000	-	5,589	364	6%
Milton	1,803	25,500,000	-	1,708	95	5%
Torrance	1,030	16,800,000	-	987	43	4%
Twechar	629	7,300,000	-	606	23	4%
Waterside	1,246	12,300,000	-	1,206	40	3%

8. Delivery Areas

8.1 Spatial Approach to Domestic Properties

8.1.1 Purpose

This section sets out how interventions could be prioritised and to identify specific geographical Delivery Areas for possible action. It considers the characteristics of the East Dunbartonshire buildings using a spatial approach and shows differences between areas of East Dunbartonshire with respect to the LHEES considerations. This approach identifies areas where delivery actions can be targeted.

Specifically, this is to allow locations to be identified for any future area-based funding mechanism. By setting out a range of metrics this allows the specific objectives of Council policy or funding scheme rules to be used to identify areas most suitable for that action.

This assessment begins with an overview of each of the LHEES Considerations and attempts to prioritise areas based on combinations of Considerations and the level of influence which EDC may wield.

Appendix L provides a map and table of the data zones in EDC. This should be used in conjunction with the analysis and outputs from this chapter to allow identification of geographic areas in the Local Authority area.

Histograms and maps

There are a number of histograms presented in section 8; these have been developed to accompany the geospatial maps for the various LHEES Considerations. The histograms show the distribution of the findings, with the maps showing the same findings, but on a map of East Dunbartonshire. Where appropriate, the poorest/highest scoring areas have been highlighted in the histograms where they are outliers.

8.1.2 Domestic Energy Efficiency

The attributes of each home were taken from the Home Analytics data; this contains information on the construction of each building and the suitability of a range of energy efficiency measures. In order to identify areas where insulation measures have the potential to reduce heat demands and improve energy efficiency, the weightings were used as set out in Appendix I.

The Weighted Scores are distributed unevenly across East Dunbartonshire with higher scores indicating poorer energy efficiency and a greater potential for demand reduction (Figure 29: Histogram of Total Weighted Score for Energy Efficiency by data zone, Figure 30 and details in Table 21 in Appendix D). There are a small number of zones with significantly worse scores, including South Castlehill and Thorn-04, which is wholly different to other areas, suggesting that there is value in addressing energy efficiency measures in specific geographical areas.

South Castlehill and Thorn-04 has 335 homes, 320 are owner occupied. It scores highly because of very high rates of single-glazing (43%), uninsulated walls (90%) and absent loft insulation (24%). The properties are typically detached and semi-detached, built before 1919. Around half of the properties have data gleaned from EPCs, while the imputed data may be erroneous, it should not have such a large sway and so the estimate of Weighted Score is probably indicative of reality.

Figure 29: Histogram of Total Weighted Score for Energy Efficiency by data zone

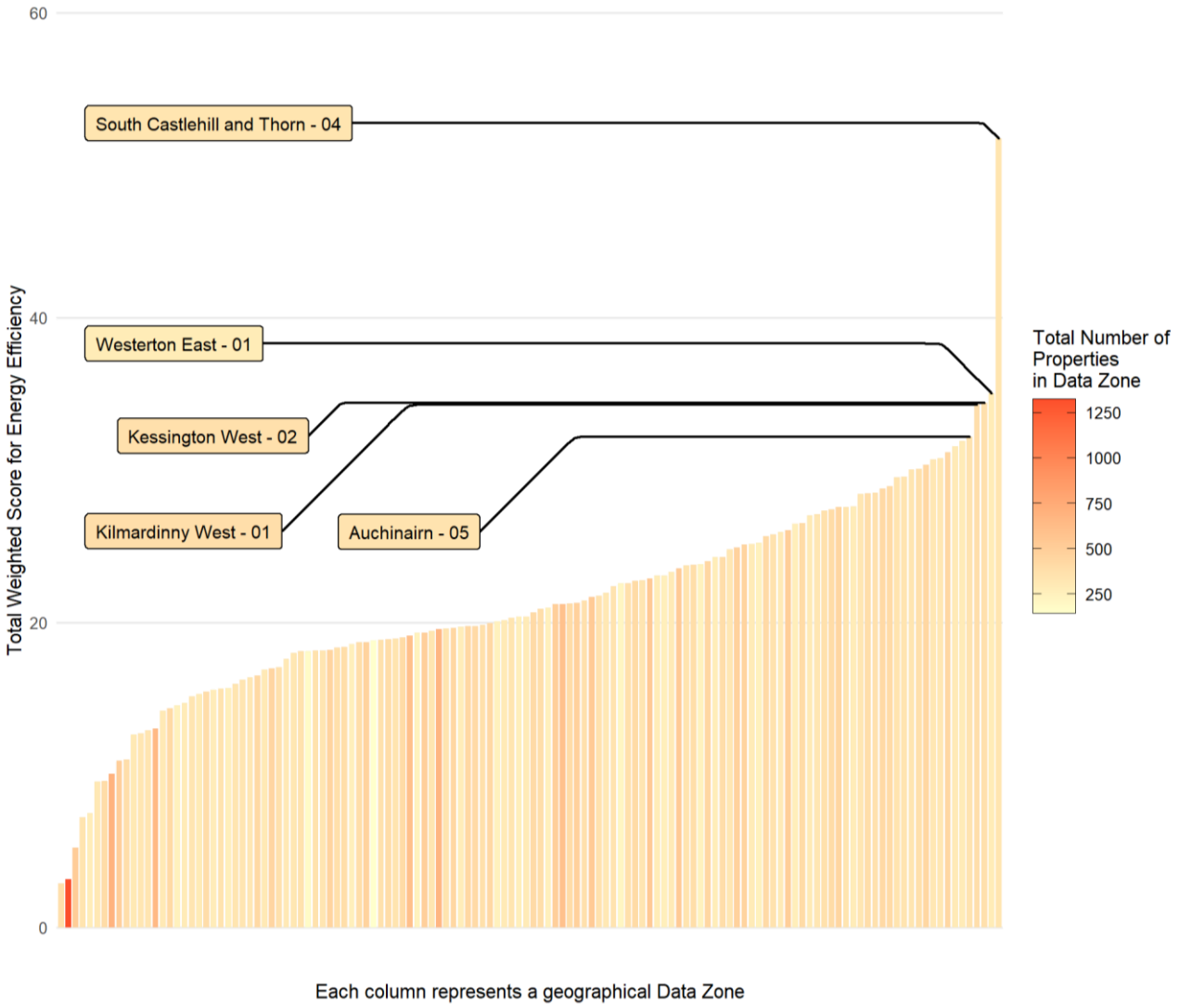
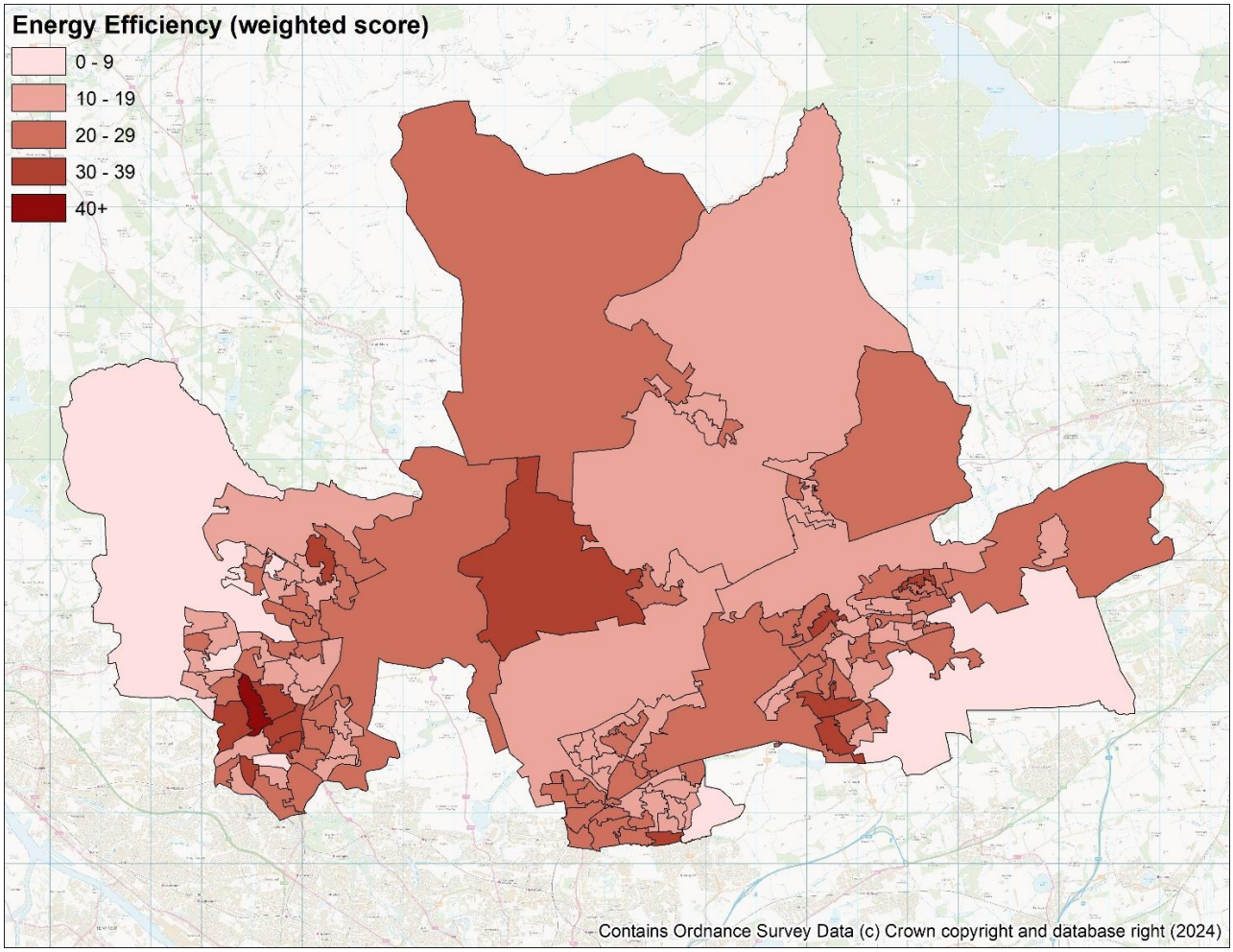


Figure 30: Map of Weighted Energy Efficiency Score – Data Zone Level



8.1.3 Energy Efficiency as a Driver for Fuel Poverty

This section considers where energy efficiency measures have the potential to reduce fuel poverty. The analysis uses a weighted score as set out in Appendix I.

The Weighted Scores are distributed unevenly across East Dunbartonshire (as seen in Figure 31, Figure 32 and details in Table 22 in Appendix D), with higher scores indicating a greater risk that families are experiencing fuel poverty as a result of poor energy efficiency. There are a small number of zones with significantly worse scores, suggesting that there is value in addressing energy efficiency measures in these specific geographical areas.

Figure 31: Histogram of Total Weighted Score for energy efficiency as a driver of Fuel Poverty by data zone

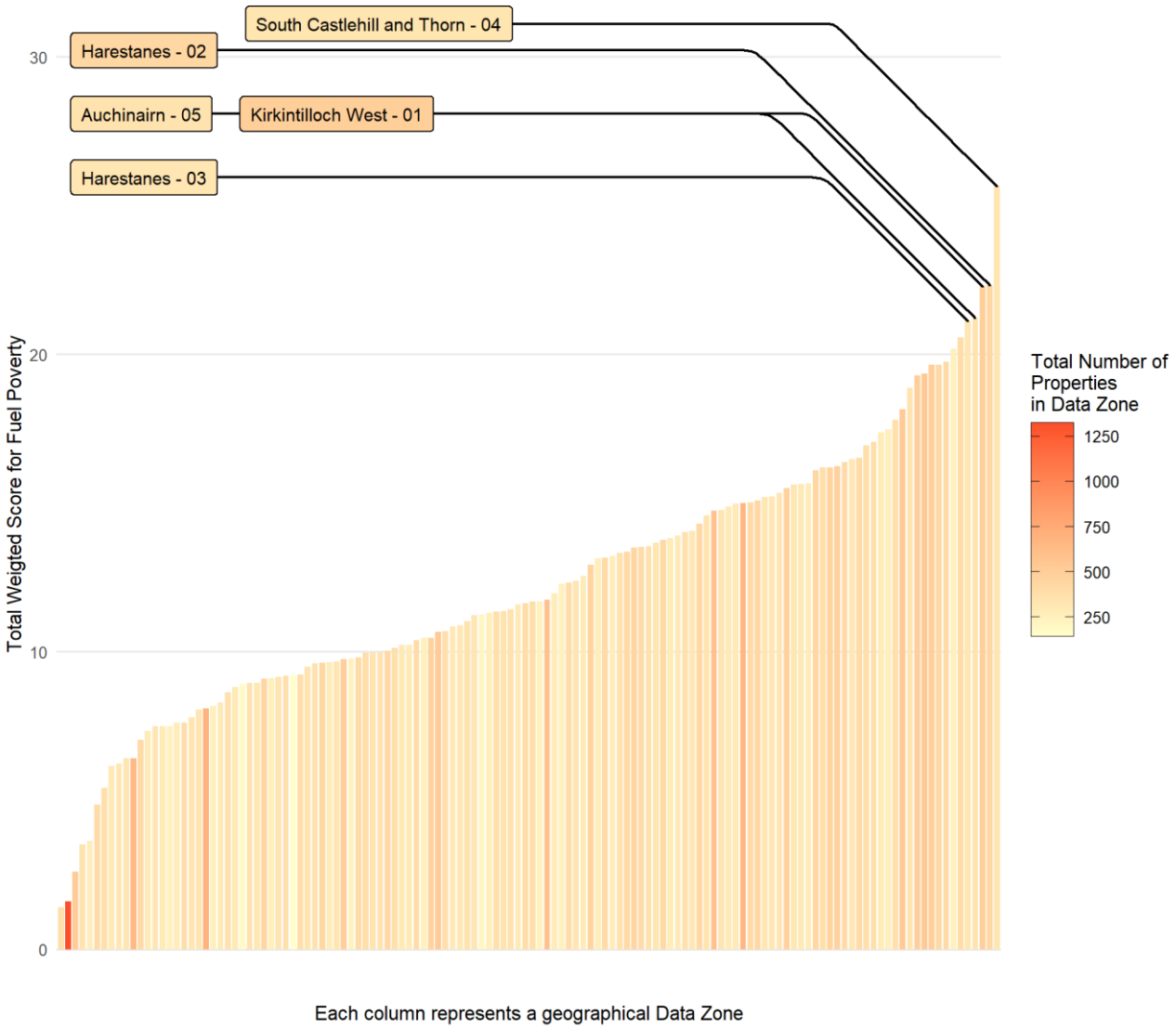
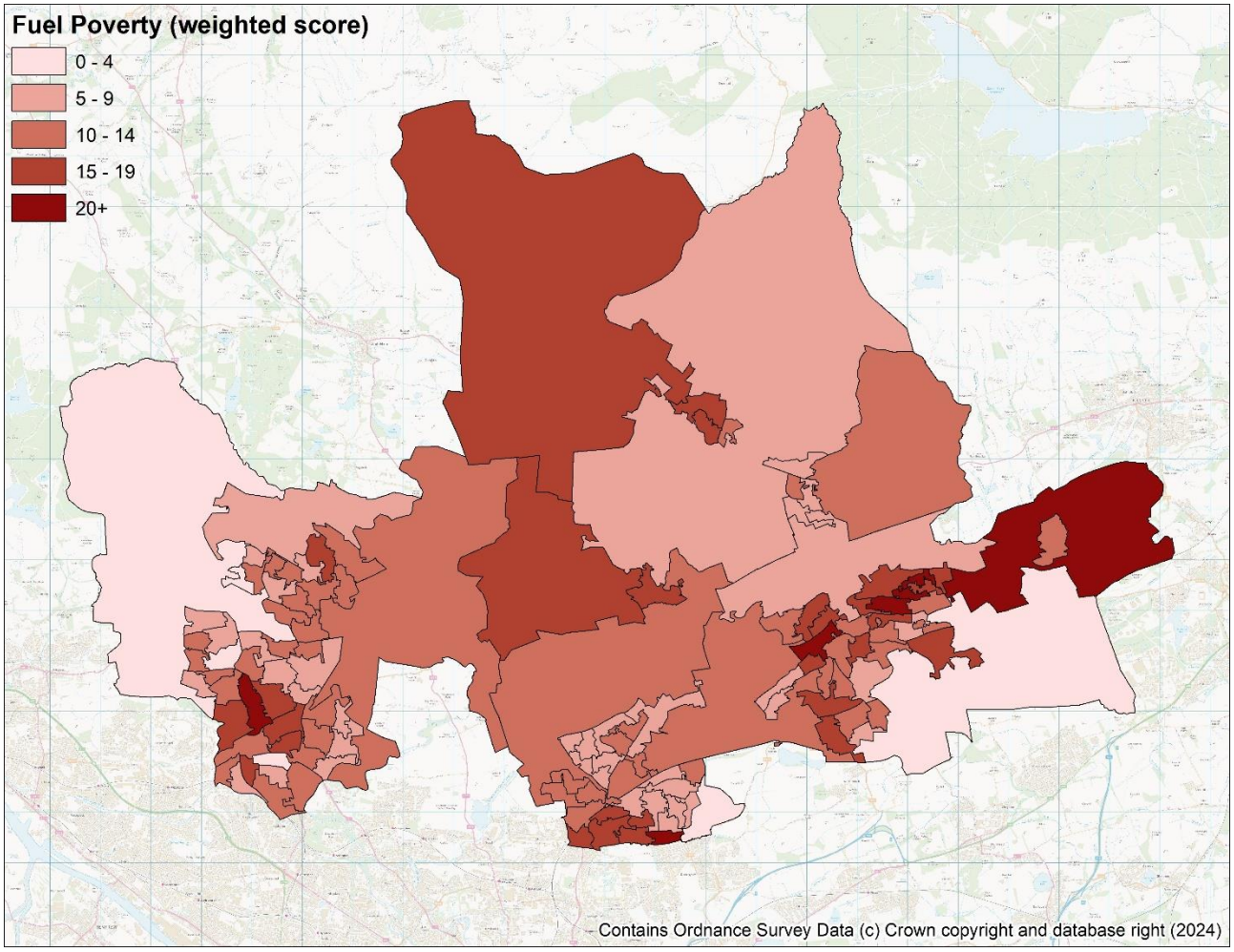


Figure 32: Map of Energy Efficiency as a Driver of Fuel Poverty – Data Zone Level



8.1.4 Mixed-Tenure, Mixed-Use and Historical

Mixed-tenure and mixed-use properties have unique challenges for the implementation of interventions as they have multiple stakeholders to engage with that may have conflicting interests. Mixed-tenure buildings are those which have multiple properties of the same use, whereas mixed-use buildings will have multiple properties in the same buildings that have different use profiles and are not all residential, such as a shop with a flat above it.

8.1.4.1 Mixed-Tenure

Figure 33 and Figure 34 describe the distribution of mixed-tenure buildings between data zones in East Dunbartonshire. This ownership type will require specialised engagement, funding and delivery strategies in order to implement the necessary energy efficiency measures. The technical solutions themselves will also potentially differ, since this group includes the range from high flats to sandstone tenements. A dedicated working group to resolve the unique challenges of mixed-tenure buildings may be the best course of action to make progress on the properties that may have multiple stakeholders and heating profiles. The prioritisation of zones will be dependent on the prioritisation identified for energy efficiency measures as much as on the order presented here.

Figure 33: Histogram of Mixed Tenure properties by data zone

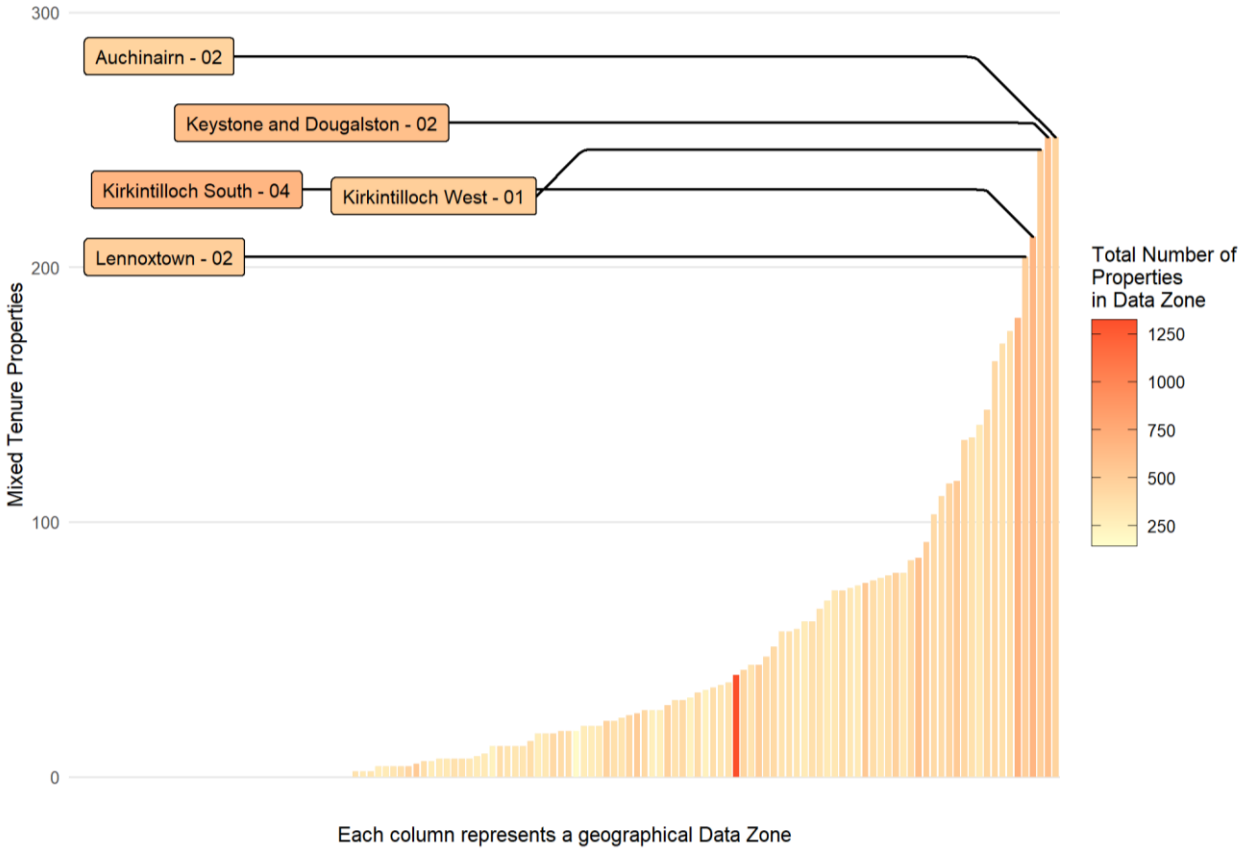
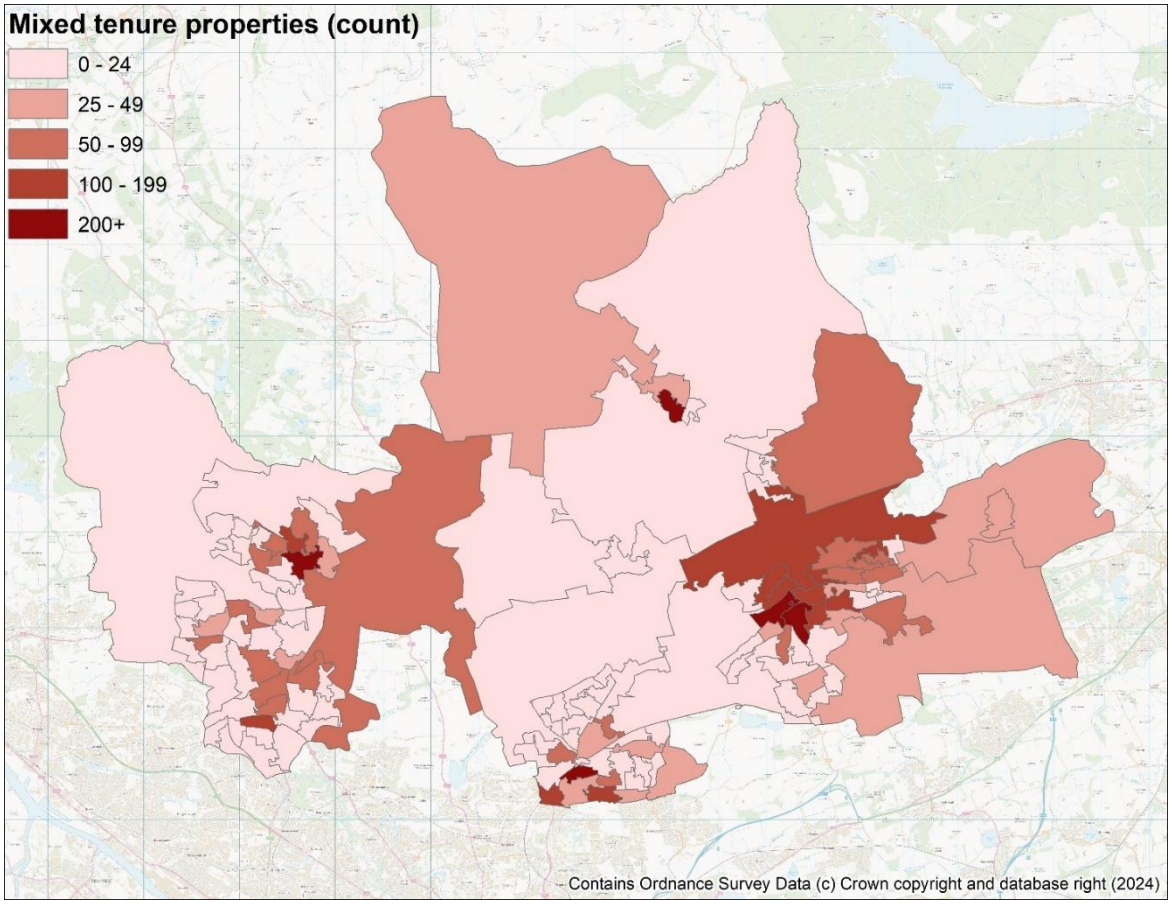


Figure 34: Map of Mixed-Tenure Properties – Data Zone Level



8.1.4.2 Conservation Areas and Listed Buildings

A small percentage of homes in East Dunbartonshire are in conservation areas or have listed building status, both of which may restrict the scope or increase the cost of energy efficiency measures including glazing changes, wall insulation and the installation of heat pumps. The data zone with the second-highest number of homes in a conservation area is South Castlehill and Thorn-04 (Figure 35), which adds an additional challenge to the task of improving their energy efficiency. However, none of those properties are listed (Figure 37).

Figure 35: Histogram of properties in conservation areas by data zone

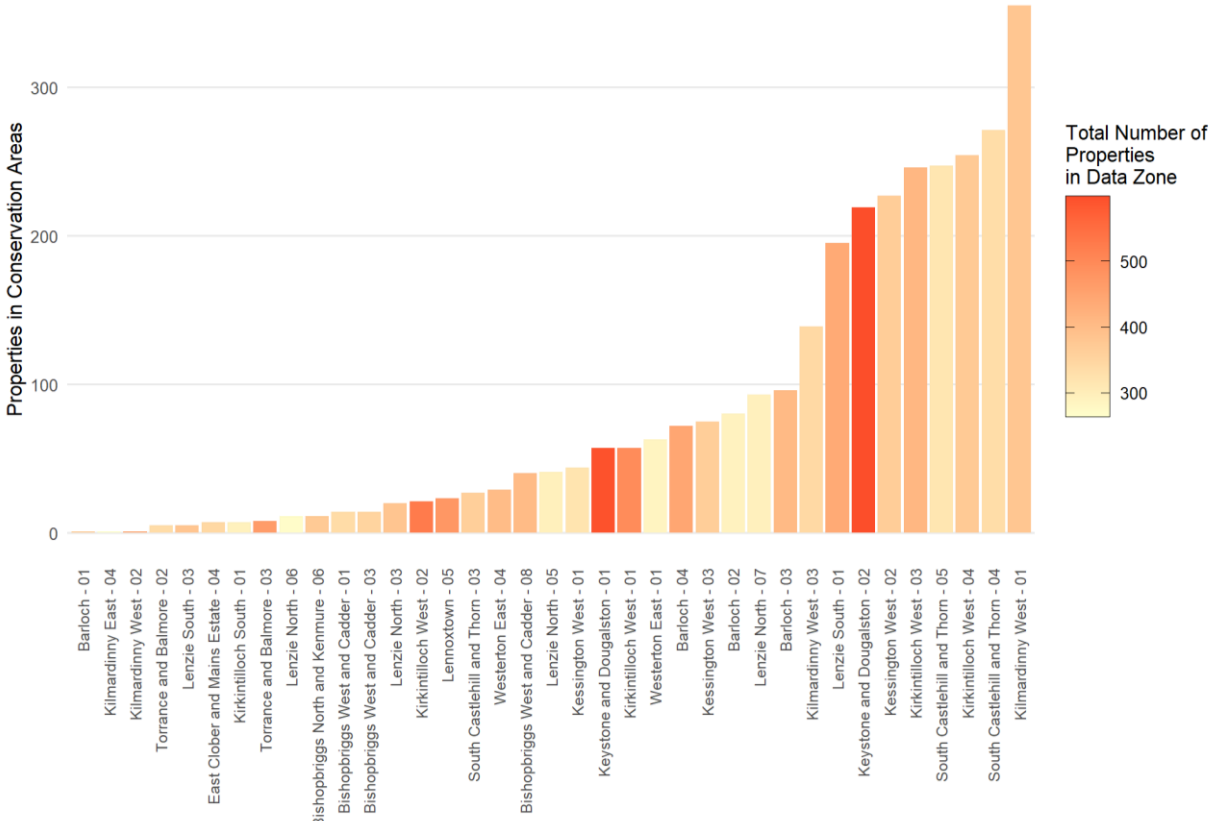


Figure 36: Mapped Domestic Properties within Conservation Area by Data Zone

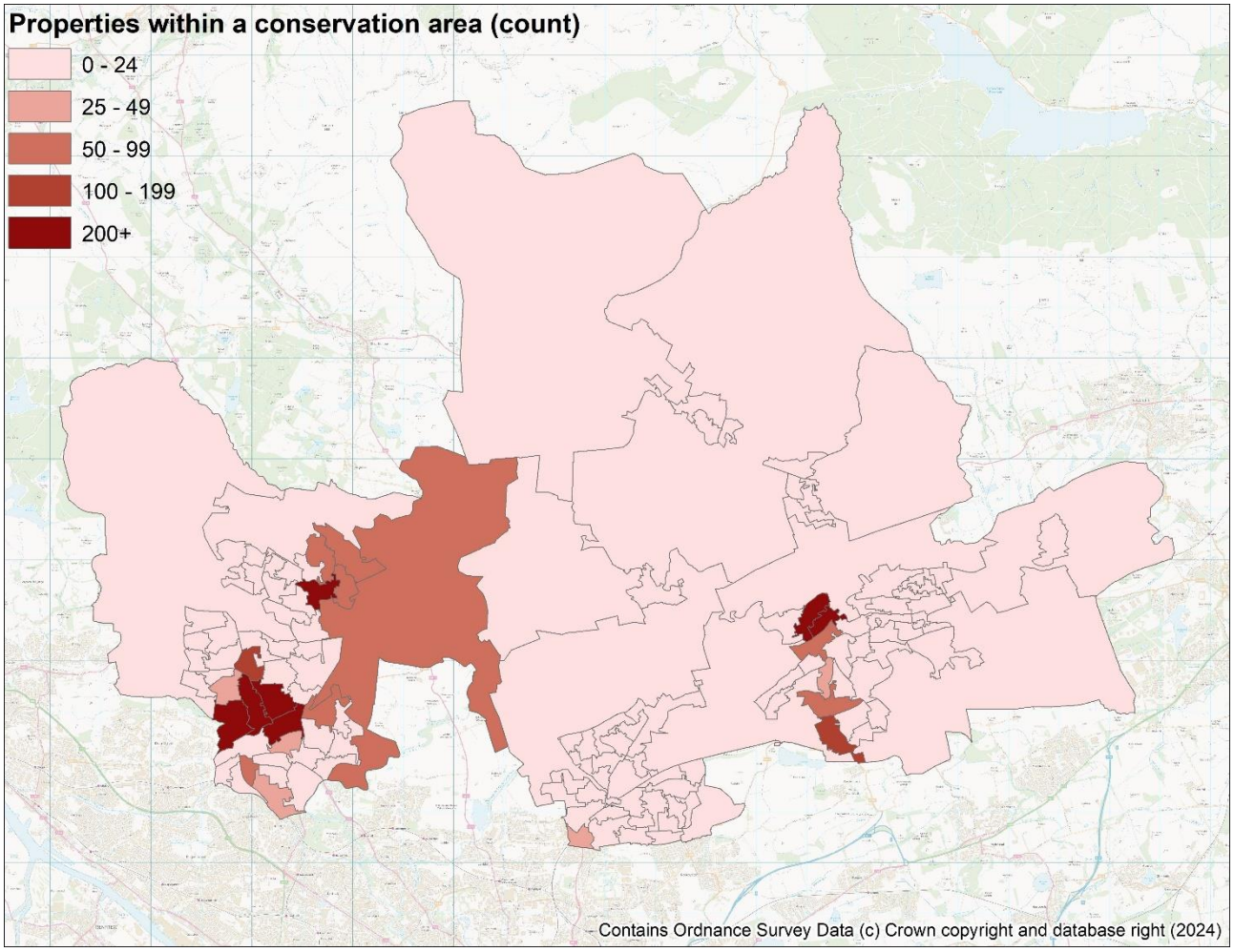


Figure 37: Histogram of listed building number by data zone

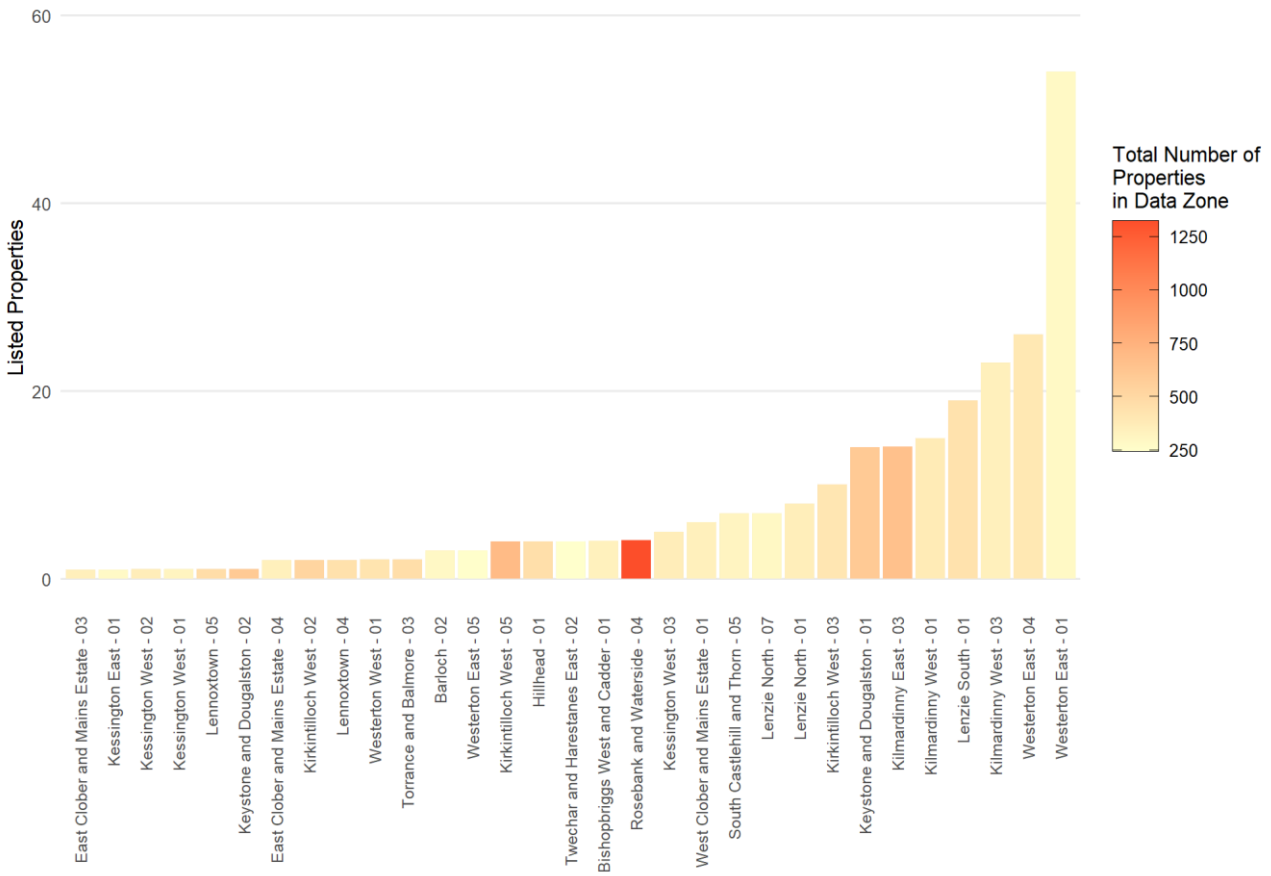
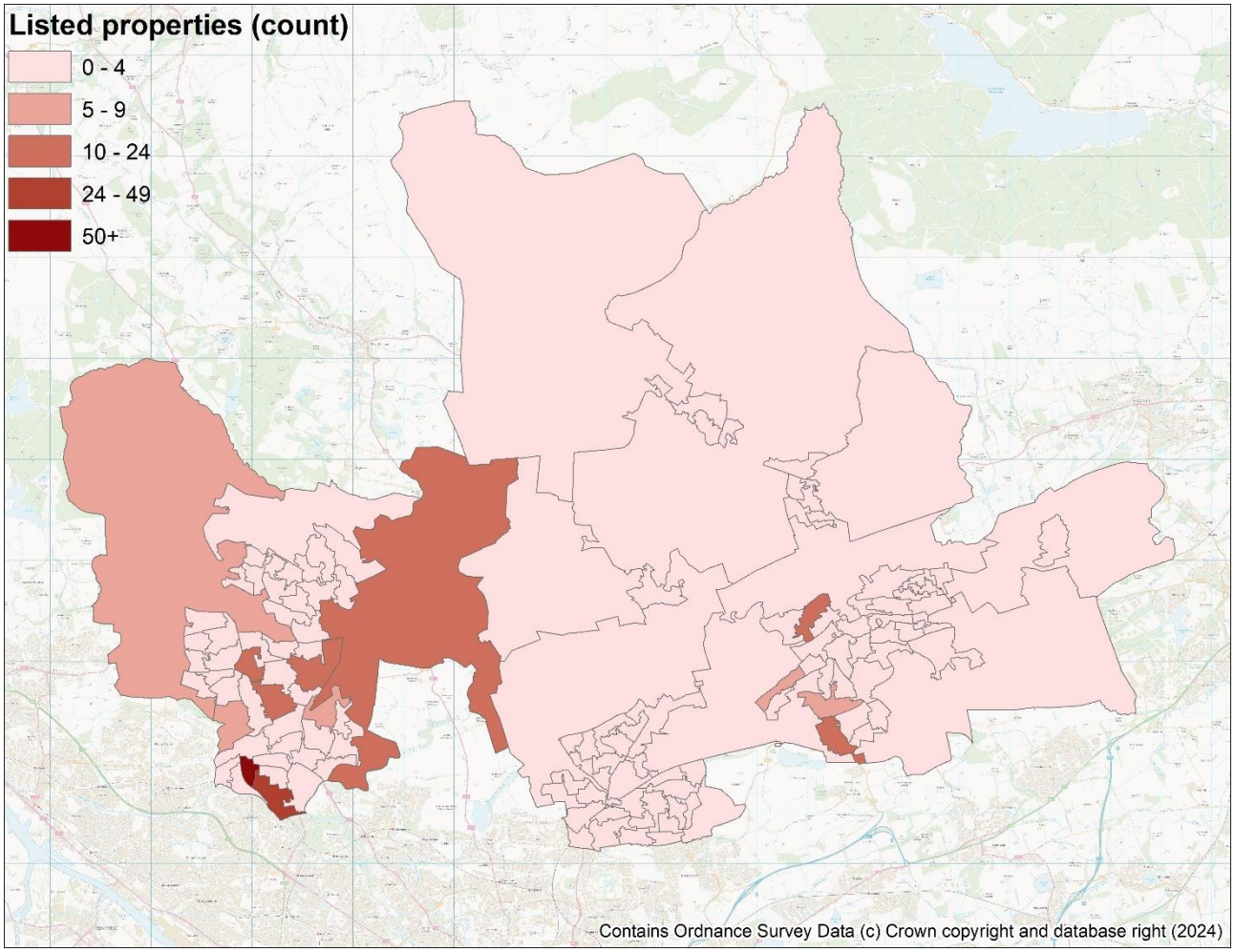


Figure 38: Mapped Listed Domestic Properties by Data Zone



8.1.5 Fuel Poverty – Absolute

The fuel poverty indicator analysis used in the baseline tool was supplemented with additional analysis based on the heat demands and fuel type presented in the Home Analytics dataset and the subsequent cost to heat each property based on the utility prices given in Table 12. These prices are from energy savings trust accessed July 2024.[59] This building-level analysis was aggregated to strategic zone and is intended to provide an indication of how affordable it is to heat houses in each area and is not a detailed prediction.

Table 12: Fuel prices used in fuel poverty analysis

Fuel	Price per kWh
Electricity Rate	£0.224
Mains Gas	£0.055
Oil	£0.071
LPG	£0.087
Biomass/Solid	£0.085
Standing Charges	
Mains Gas	£0.31

[59] https://energysavingtrust.org.uk/about-us/our-data/

Fuel	Price per kWh
Electricity	£0.60

The number of homes in each income decile are given in Table 13; 3% of households are in income decile 1, however based on the energy prices above and heat demand in home analytics, 1% of properties could be lived in by these households without them being in fuel poverty. SIMD 1 households therefore outnumber properties which they can afford to heat while avoiding being in fuel poverty by a rate of 3 to 1.

Considering average households, 28% of homes are in decile Five or lower. The affordability of heating, taken as the percentage of homes which could be affordably heated by households in income decile Five or lower, are listed in in Table 14.

Table 13: Number of homes by SIMD income decile

SIMD Income	Number of households	Percentage of households by income decile
One	1,415	3%
Two	890	2%
Three	4,955	10%
Four	4,968	10%
Five	1,398	3%
Six	1,315	3%
Seven	5,104	11%
Eight	5,062	10%
Nine	10,894	22%
Ten	12,500	26%

Table 14: Percentage of homes which could be affordably heated by households in income decile five or lower

Strategic Zone	Percentage of homes which could be heated by households in income decile five or lower without being in fuel poverty
Baldernock	68%
Bearsden East	84%
Bearsden West	87%
Bearsden North	87%
Bishopbriggs	95%
Campsie	97%
Kirkintilloch	93%
Lenzie	91%
Milngavie	91%
Milton	95%

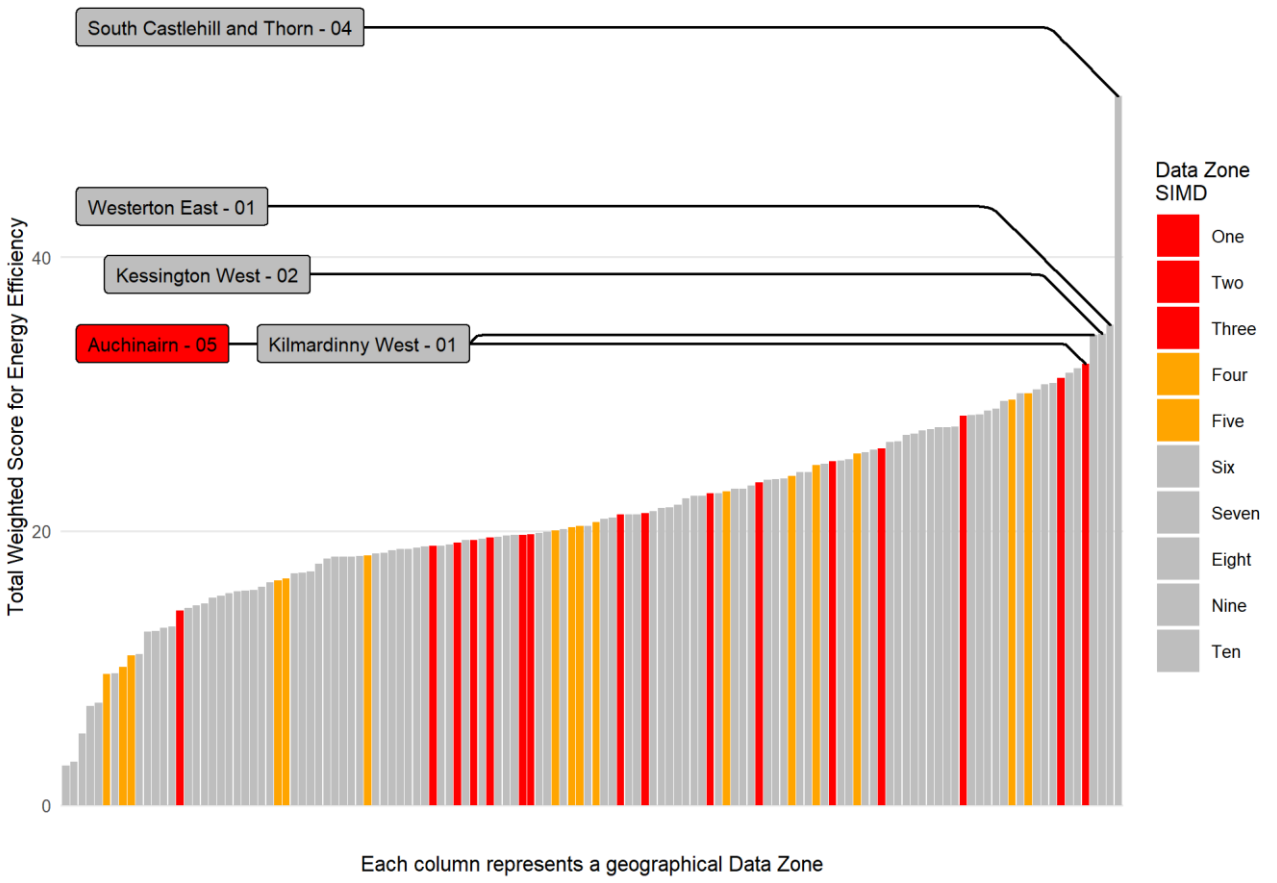
Strategic Zone	Percentage of homes which could be heated by households in income decile five or lower without being in fuel poverty
Torrance	92%
Twechar	97%
Waterside	96%

8.1.6 Overlaying Multiple Considerations – Generation of Priority Delivery Areas

The analysis has generated various rankings for the purpose of determining where to start with interventions. The Weighted Energy Efficiency Score and Fuel Poverty rankings are, thanks to the latter being based on the former, very highly correlated and could be used interchangeably with similar outcomes. However, SIMD and income ranks are not correlated at all with the Weighted Energy Efficiency Score.

Figure 39 highlights that the data zones with the worst energy performance are ones which are relatively affluent, **so addressing funding towards fuel consumption reductions would not universally address the issue of real-world fuel poverty.** However, since there are likely to be income poor households in areas which are more affluent on average, the poor energy efficiency of those properties or the relative lack of energy efficient properties could still warrant targeted intervention.

Figure 39: Histogram of Total Weighted Energy Efficiency Score by data zone and SIMD decile



Focussing on the data zones with SIMD scores of three or less (Figure 40), it is apparent that the zones with the highest scores have low numbers of properties owned by the Council in both absolute and percentage terms. While this shows a limited scope for the Council to influence the development of intervention schemes in these zones, this highlights the need for a collaborative approach between the Local Authority and its stakeholders (including Housing Associations, private sector and social landlords, and homeowners).

Overlaying multiple considerations against one another has been used to determine some priority delivery areas. This has been undertaken to produce a set of delivery areas that the Council has some level of influence over the measures that would be undertaken; this means that the delivery areas identified have been selected that have a moderate quantity of Council owned properties within them. The criteria used for this multi-consideration approach are:

- Energy efficiency weighted score, as outlined in section 7.4 and using weightings provided in Appendix I
    - Data zones with properties that would benefit from loft, window or wall insulation measures
- SIMD score
    - We have used SIMD scores 1-3 to support developing Delivery Areas in geographical zones where there are higher instances of poverty (including fuel poverty)
- Data zones with high numbers of EDC properties
    - To support implementation projects that EDC can have the maximum influence on

Since the biggest impact of energy efficiency measures will be on homes which require multiple interventions, the same data zones are organised by those with the most properties which require 3 interventions (Figure 41). **It is proposed that these zones are selected as the initial Delivery Areas.**

Characteristics of these zones are given in Table 15, and they are mapped out in Figure 42. There are 1,003 Council-owned properties in these zones. Many of the Council's properties are in mixed tenure blocks and many have difficult-to-treat walls; two factors which add to the retrofit challenge. None of the properties are listed, however 57 properties in Kirkintilloch West - 01 are in a conservation zone.

Figure 40: Total weighted energy efficiency score for data zones with SIMD less than three

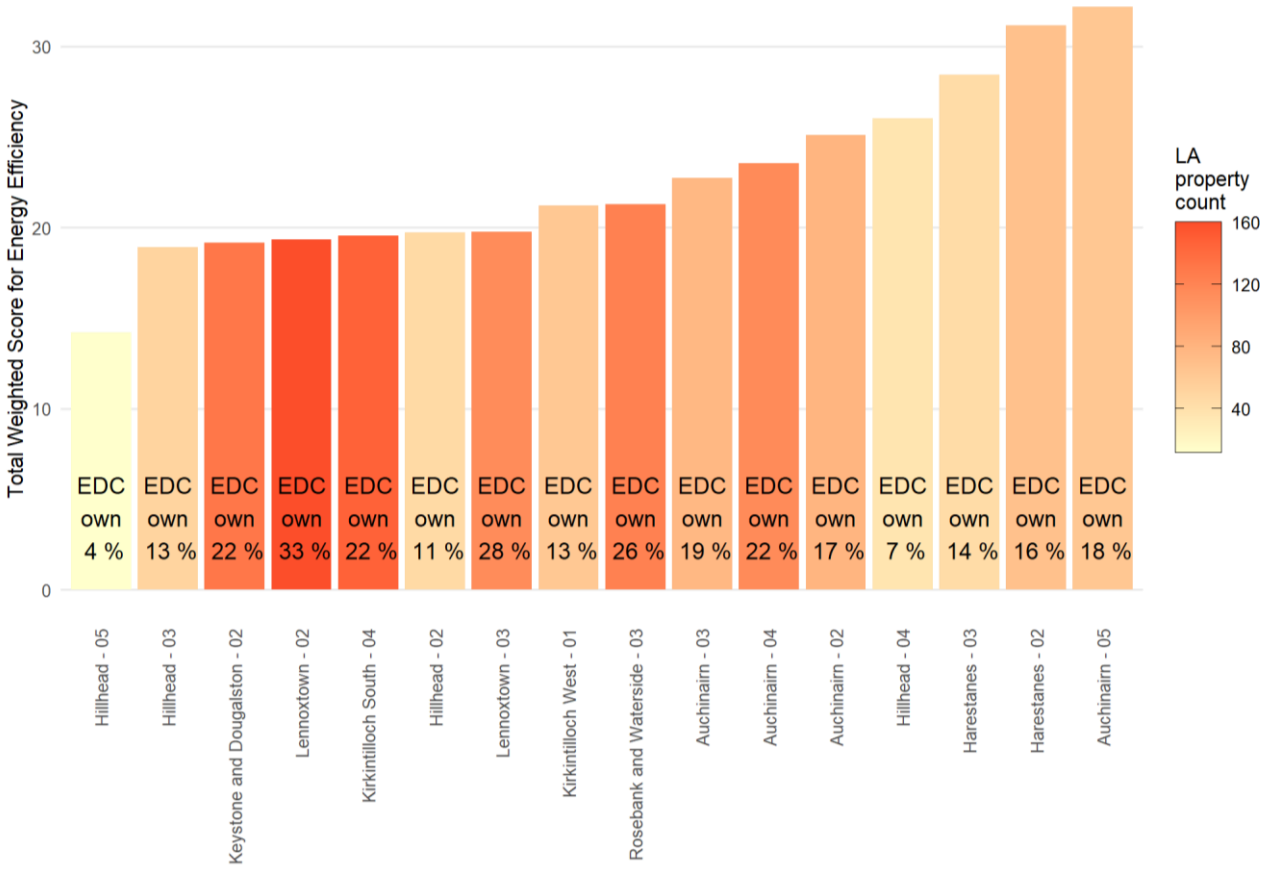


Figure 41: Council owned properties requiring three energy efficiency interventions

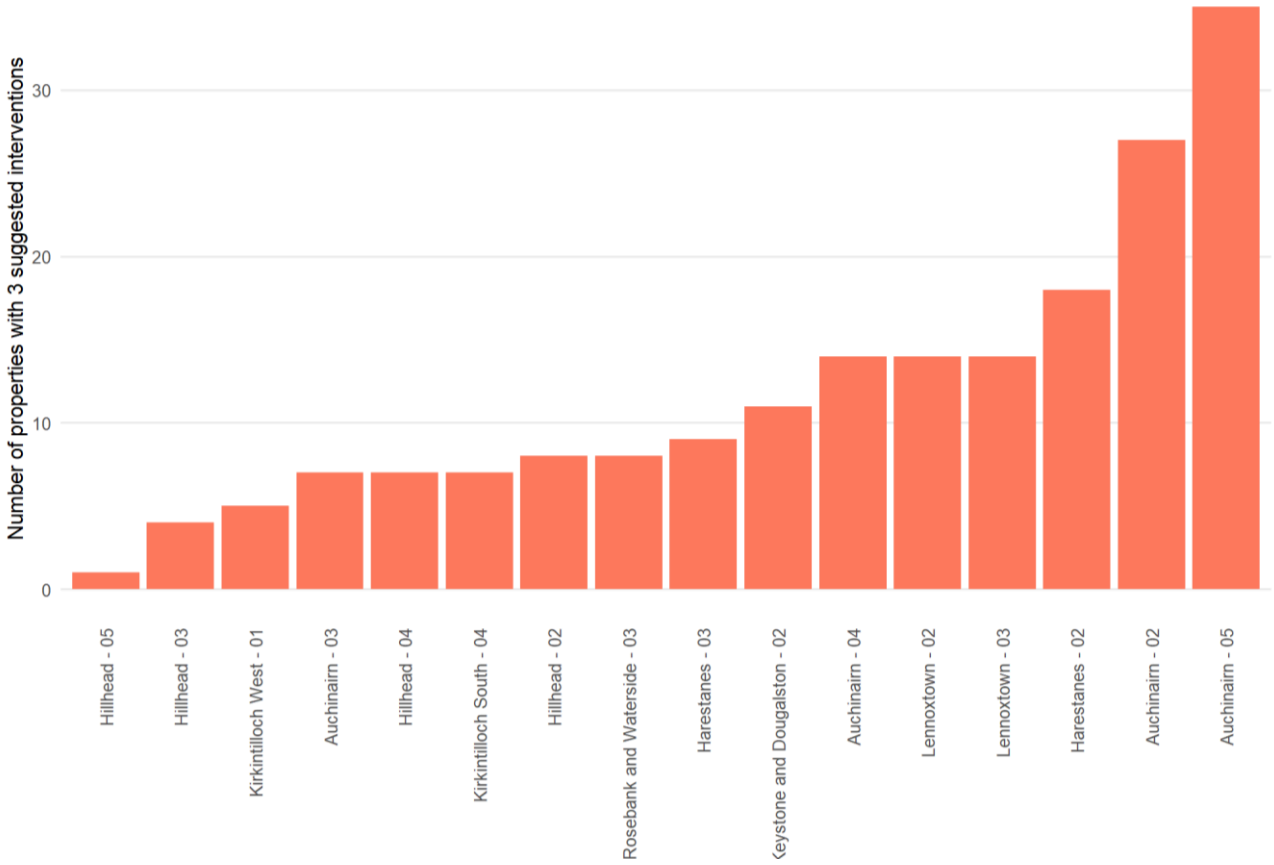
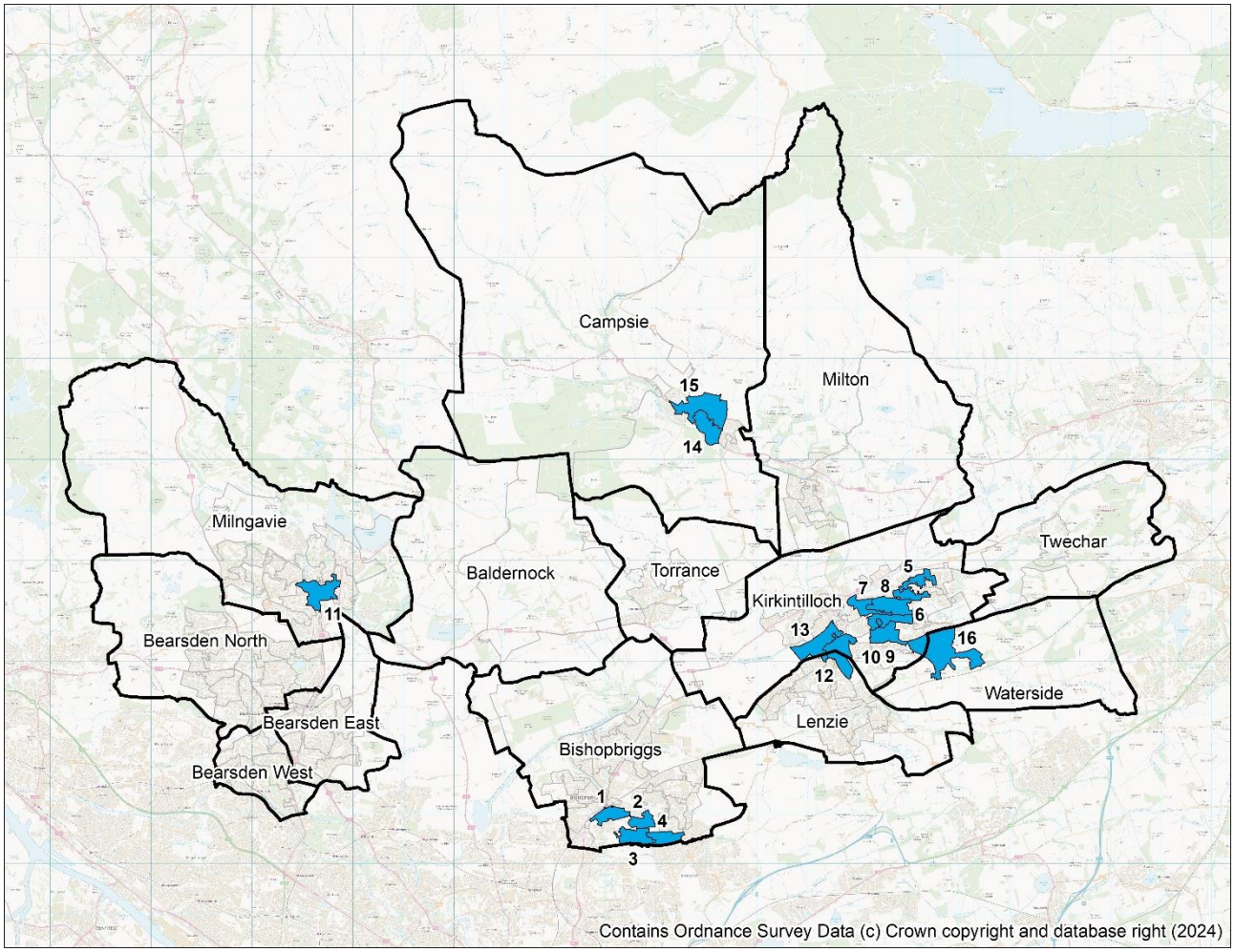


Figure 42: Priority Delivery Areas



The priority delivery areas for energy efficiency measures and decarbonisation actions are based on the approach taken to overlay multiple considerations. There are ultimately many combinations of differing LHEES considerations that could be used to produce geographical priority areas.

Table 15: Characteristics of the domestic properties in the proposed Delivery Areas

Priority Delivery Area number (Figure 42)	Data Zone	Tenure	Number of properties	Properties in mixed tenure buildings	Properties with solid stone or system-built walls
1	Auchinairn - 02	Local Authority	79	61	12
1	Auchinairn - 02	Housing Association	17	1	16
1	Auchinairn - 02	Privately Rented	73	57	18
1	Auchinairn - 02	Owner Occupied	285	132	134
2	Auchinairn - 03	Local Authority	76	24	0
2	Auchinairn - 03	Housing Association	0	0	0
2	Auchinairn - 03	Privately Rented	46	24	2
2	Auchinairn - 03	Owner Occupied	285	37	8
3	Auchinairn - 04	Local Authority	115	47	11

Priority Delivery Area number (Figure 42)	Data Zone	Tenure	Number of properties	Properties in mixed tenure buildings	Properties with solid stone or system-built walls
3	Auchinairn - 04	Housing Association	48	2	1
3	Auchinairn - 04	Privately Rented	57	20	11
3	Auchinairn - 04	Owner Occupied	309	47	30
4	Auchinairn - 05	Local Authority	63	9	10
4	Auchinairn - 05	Housing Association	10	0	5
4	Auchinairn - 05	Privately Rented	40	13	11
4	Auchinairn - 05	Owner Occupied	232	22	79
5	Harestanes - 02	Local Authority	68	34	50
5	Harestanes - 02	Housing Association	41	25	13
5	Harestanes - 02	Privately Rented	34	19	21
5	Harestanes - 02	Owner Occupied	293	66	178
6	Harestanes - 03	Local Authority	44	21	20
6	Harestanes - 03	Housing Association	26	12	21
6	Harestanes - 03	Privately Rented	26	8	8
6	Harestanes - 03	Owner Occupied	229	37	92
7	Hillhead - 02	Local Authority	46	10	0
7	Hillhead - 02	Housing Association	210	69	1
7	Hillhead - 02	Privately Rented	34	29	0
7	Hillhead - 02	Owner Occupied	137	55	0
8	Hillhead - 03	Local Authority	51	6	2
8	Hillhead - 03	Housing Association	137	31	1
8	Hillhead - 03	Privately Rented	39	8	0
8	Hillhead - 03	Owner Occupied	168	32	1
9	Hillhead - 04	Local Authority	36	11	2
9	Hillhead - 04	Housing Association	169	26	55
9	Hillhead - 04	Privately Rented	42	1	2
9	Hillhead - 04	Owner Occupied	252	6	37
10	Hillhead - 05	Local Authority	12	3	2
10	Hillhead - 05	Housing Association	112	55	90
10	Hillhead - 05	Privately Rented	52	43	7
10	Hillhead - 05	Owner Occupied	129	37	79
11	Keystone and Douglaston - 02	Housing Association	14	1	0
11	Keystone and Douglaston - 02	Privately Rented	90	51	30
11	Keystone and Douglaston - 02	Owner Occupied	394	143	58
12	Kirkintilloch South - 04	Local Authority	147	31	14
12	Kirkintilloch South - 04	Housing Association	6	2	3
12	Kirkintilloch South - 04	Privately Rented	135	67	26

Priority Delivery Area number (Figure 42)	Data Zone	Tenure	Number of properties	Properties in mixed tenure buildings	Properties with solid stone or system-built walls
12	Kirkintilloch South - 04	Owner Occupied	380	112	113
13	Kirkintilloch West - 01	Local Authority	62	38	22
13	Kirkintilloch West - 01	Housing Association	53	14	21
13	Kirkintilloch West - 01	Privately Rented	96	64	34
13	Kirkintilloch West - 01	Owner Occupied	284	130	60
14	Lennoxtown - 02	Local Authority	160	76	13
14	Lennoxtown - 02	Housing Association	28	20	0
14	Lennoxtown - 02	Privately Rented	70	41	17
14	Lennoxtown - 02	Owner Occupied	231	67	44
15	Lennoxtown - 03	Local Authority	114	19	3
15	Lennoxtown - 03	Housing Association	23	4	1
15	Lennoxtown - 03	Privately Rented	20	5	3
15	Lennoxtown - 03	Owner Occupied	253	19	3
16	Rosebank and Waterside - 03	Local Authority	123	27	24
16	Rosebank and Waterside - 03	Housing Association	3	2	1
16	Rosebank and Waterside - 03	Privately Rented	52	22	4
16	Rosebank and Waterside - 03	Owner Occupied	299	29	64

As owner occupied building dominate the housing throughout EDC (Figure 5), they tend to have higher heating demands (Figure 6) comparatively and the vast majority can be decarbonised with either a heat pump solution or a heat pump solution plus energy efficiency upgrades (Table 10) – targeting specific geographic areas for intervention is not as clear cut. The process outlined above has singled out specific interventions and overlaid these against low SIMD score, resulting in a selection of key priority areas that have been highlighted as the priority delivery areas.

The LHEES considerations call for a holistic approach (as outlined in section 4.1.2.) to tackle fuel poverty, poor energy efficiency and complexities with mixed tenure and historic buildings. While the selected priority delivery areas complement EDC's fabric first approach for energy efficiency improvements and higher level of influence over council owned properties, there are wider opportunities to attract additional resources and support through area-wide collaborations with stakeholders. The evidence and options report for EDC's climate action plan elaborates on the indirect methods of influence for the Council to decarbonise various sectors, including buildings and energy. Engagement, establishing strategic partnerships, demonstration/ showcasing and place shaping could influence existing and new buildings and refurbishments, as well as large-scale infrastructure projects. However, there is a stronger influence over procurement and direct management EDC's own properties, which could assist the Council to lead by example.

EDC also has an influential role in its capacity as a Local Planning Authority (LPA), setting planning policy and determining the spatial strategy for the area. This is primarily relevant to energy and sustainability standards for new developments, but development management policies can also affect the rate of retrofitting and uptake of small-scale renewables across the local authority. LHEES outcomes should therefore inform the local development plans (LDP) and local outcomes improvement plans (LOIP) while forming a key part in EDC's climate action plan (CAP).

An alternative methodology would be to use a technology-led approach, grouping intervention categories by tenure, property owners, and other factors which would affect the viability and benefit of specific technologies.

This would allow alternative means of targeting properties for interventions, either by the Council in its own properties or to assist other stakeholders in identifying changes they can make to their properties.

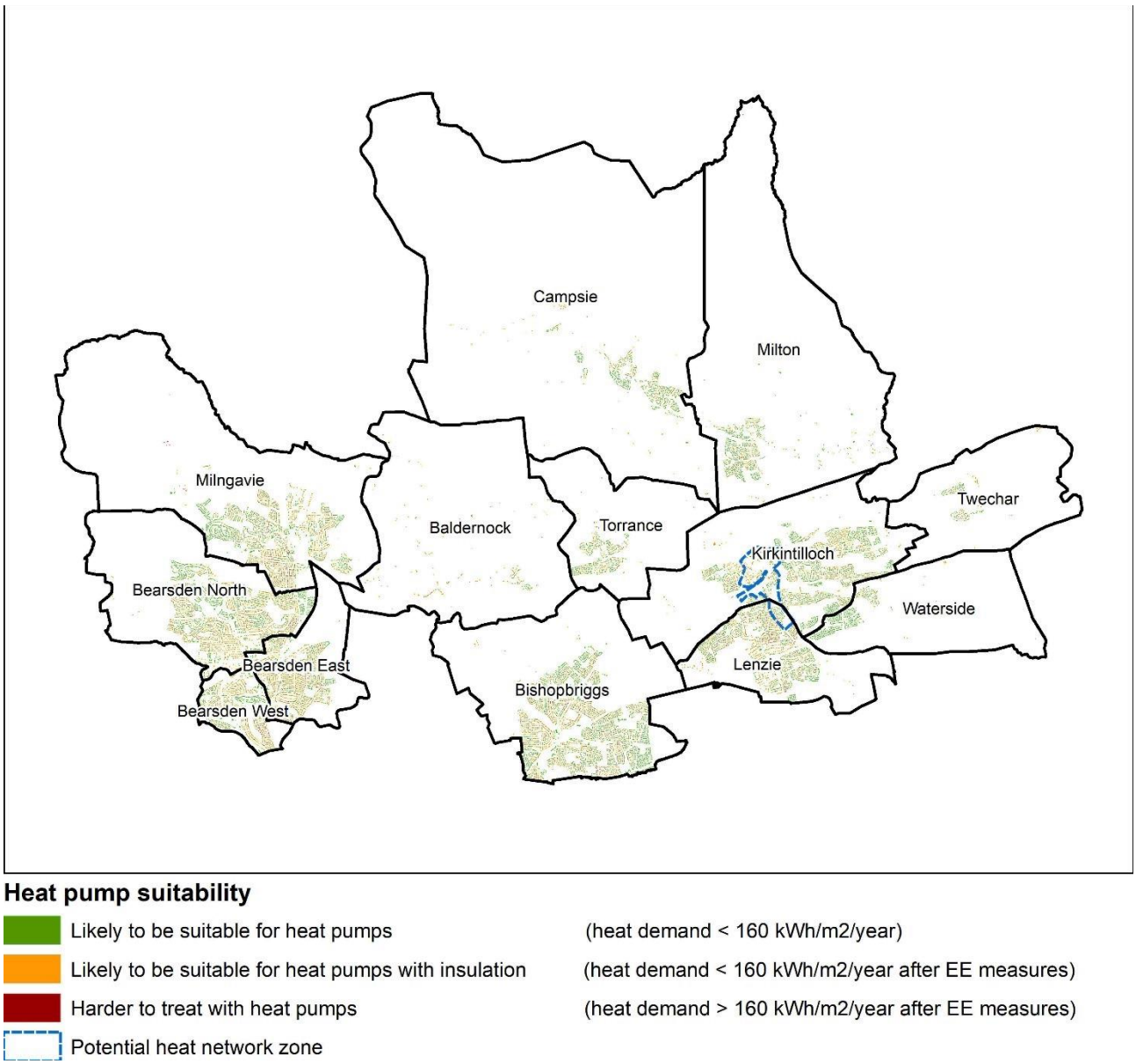
Appendix J provides a non-geographical breakdown of the various interventions that could be undertaken, split by tenure.

8.1.7 Heat Pump Suitability

Using the method to determine suitability for heat pumps outlined in 7.7.2.1, each domestic property has been assessed and mapped. Detailed maps are provided in Appendix G and an overview is shown below in Figure 43: Heat Pump Suitability

The harder to treat properties are not located in large clusters, so low carbon solutions for these are not best planned with by a geographic approach. However, properties suitable for heat pump installation and likely to be suitable with insulation upgrades show clusters across several strategic zones, which may present opportunities for a geographically planned approach for necessary interventions for infrastructure improvements, feasibility studies and applications for funding opportunities. Areas overlapping with priority delivery areas are shown in Appendix G, which could serve as a foundation for area-based feasibility studies, pilot projects and focused actions.

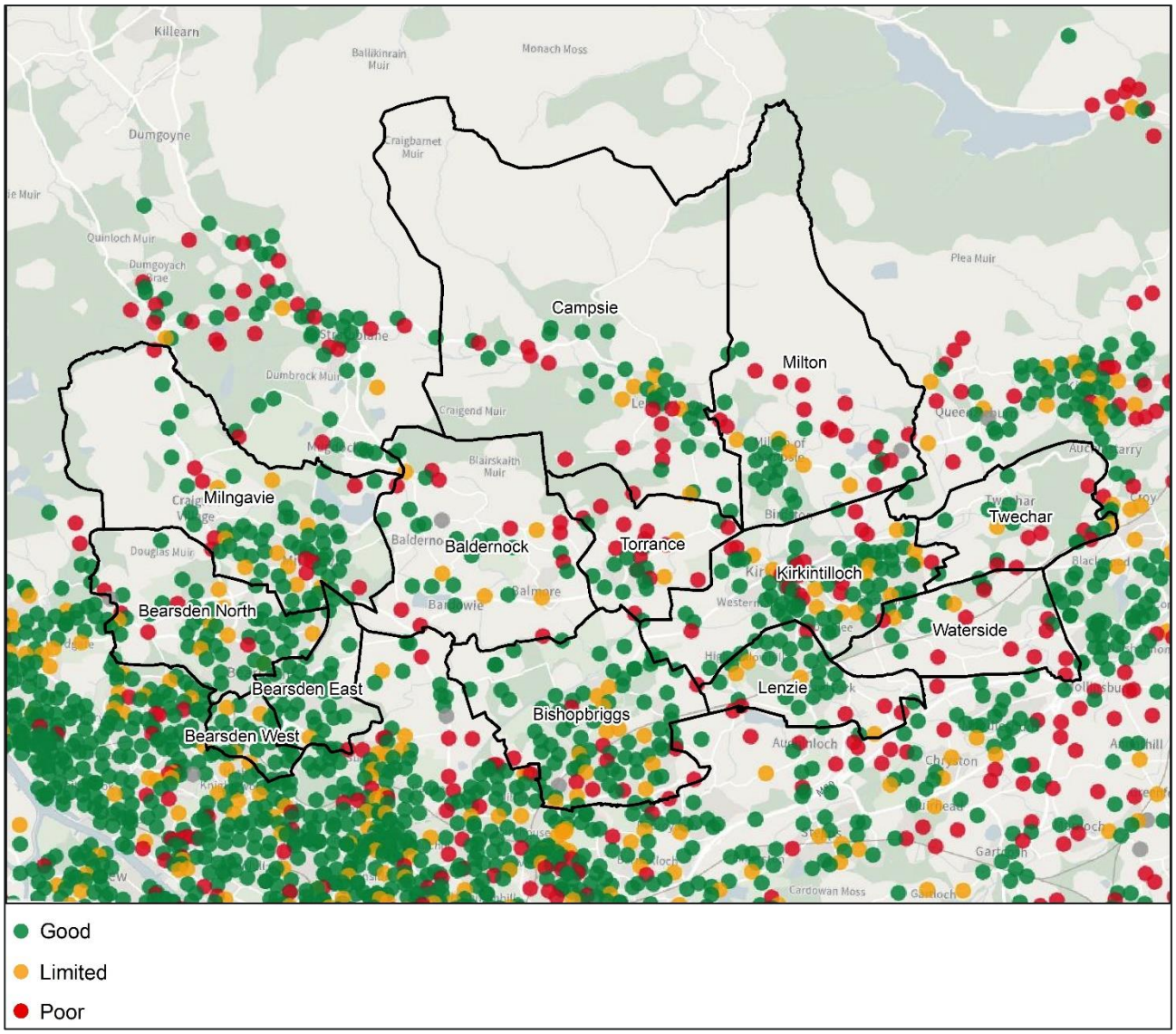
Figure 43: Heat Pump Suitability



Installing additional heat pumps requires the electricity network to be able to support them. The website of the electricity Distribution Network Operator in the area (Scottish Power Energy Networks) shows the ability of each transformer to have an additional 25kVA added to it. This is equivalent to approximately 10 domestic heat pumps being added to each transformer. As can be seen from Figure 44 there are many locations where

this would be possible with the existing grid and a number of locations where it would not. Even in the locations where constraints are shown, it may be possible for a small number of heat pumps to be installed before network upgrades are required. Overall, this shows that there is a significant number of heat pumps which can be installed and that ongoing dialogue between the Council and SPEN is important. The map is accurate at the time of writing and is subject to change over time.

Figure 44 Low voltage grid asset status (Source SPEN ConnectMore Interactive Map)



8.2 Non-domestic properties

8.2.1 Overview of properties to decarbonise

The non-domestic stock was characterised in 6.1.2 and the following conclusions could be drawn:

- The majority of properties are heated by electricity (Figure 5) – and electricity will eventually decarbonise itself, though note that in terms of total energy demand, the greatest energy vector is natural gas;
- The majority of the smallest properties are heated electrically (Figure 6) – and the remainder will likely suit small air-to-air-heat pump systems; and
- The majority of properties are either in the oldest or youngest age categories (Figure 7).

Strategically, then, the focus should be on gas-heated properties greater than 100m^2.

Common building types in this category include Offices and Workshops, and Non-residential Institutions (Figure 45: Larger, gas-heated non-domestic properties by use type

By estimated heat demand, the sectors at the top of the list are Non-residential Institutions and General Assembly (Figure 46). **These typologies should therefore be the target of decarbonisation efforts**. These are also the groups over which the Council probably have the greatest degree of ownership or influence and so plans for decarbonisation should be straightforward to organise.

However, these conclusions are based on the data available and due to the known discrepancies in the base data's estimate of heat demand and of type of fuel used, validating and improving the available data is important as part of any engagement with property owners.

Figure 47 provides a geographical map of where these non-domestic properties are located, as expected, they are predominantly located in urban areas; i.e. Kirkintilloch, Bearsden, Bishopbriggs and Milngavie.

Figure 45: Larger, gas-heated non-domestic properties by use type

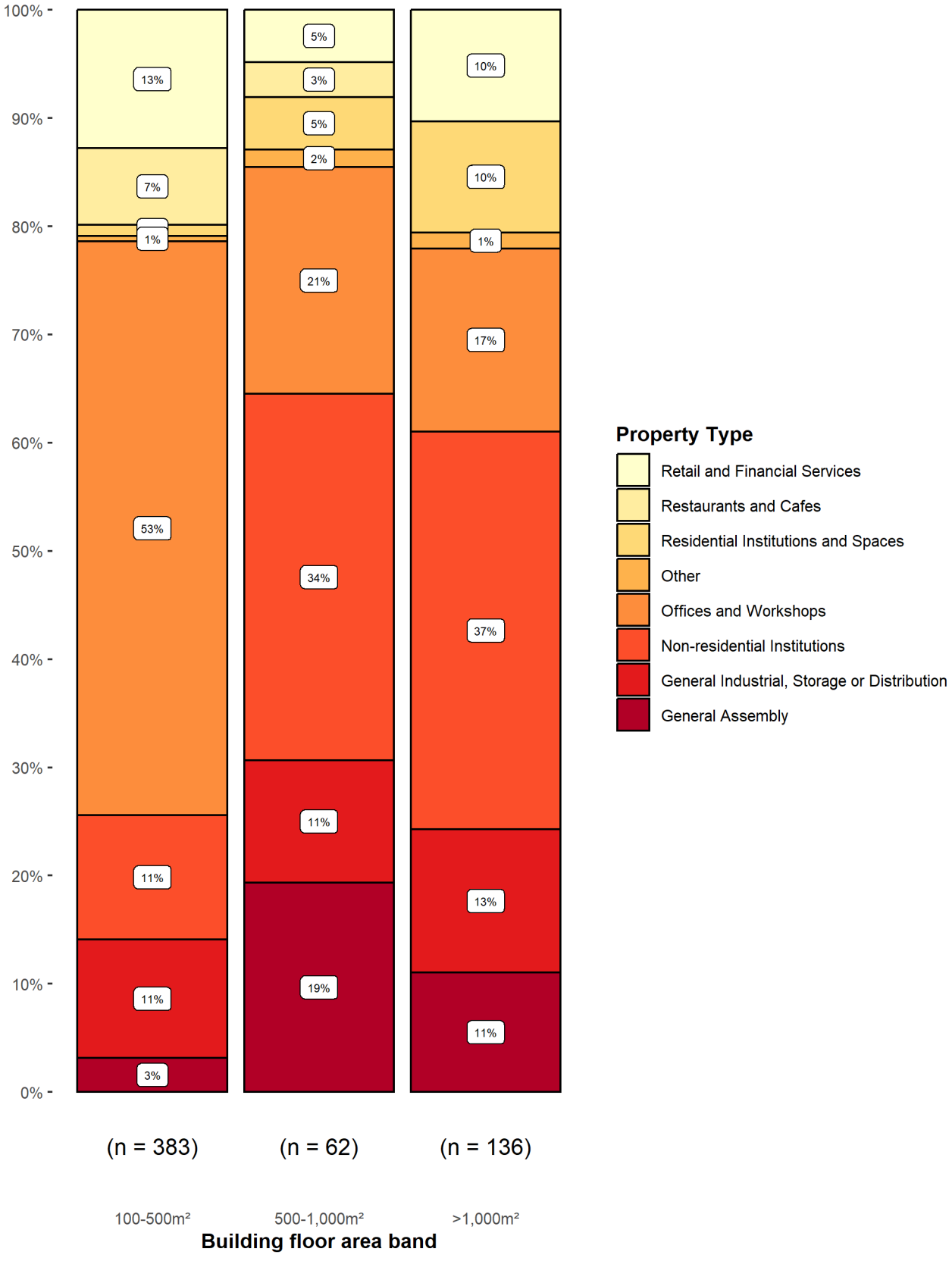


Figure 46: Space heating demand in larger, non-domestic, gas-heated buildings by type

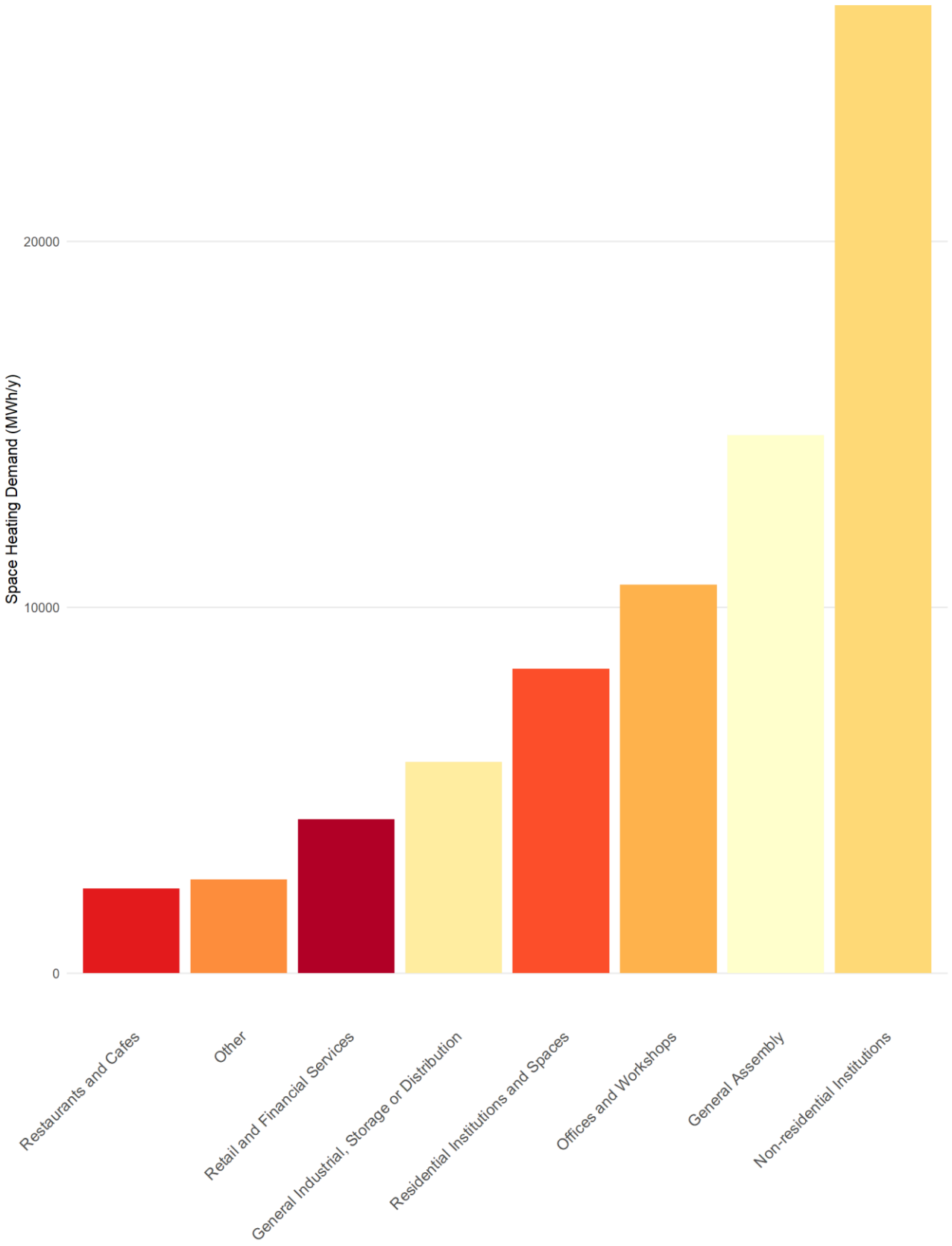
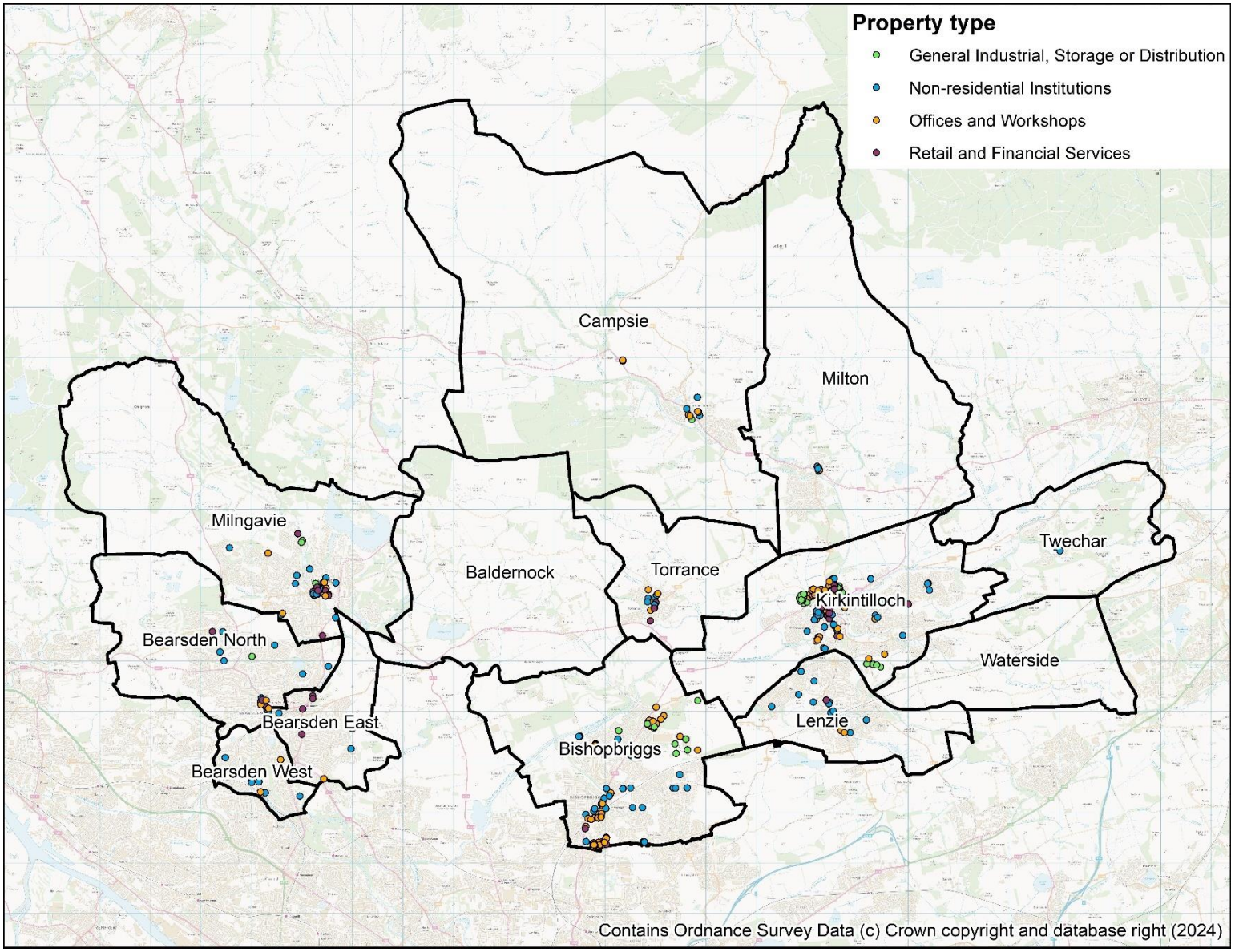


Figure 47: Map with top non-domestic, gas-heated energy consuming types



8.2.2 Non-domestic buildings energy efficiency

Using the publicly available EPC records, 606 EPCs are lodged for East Dunbartonshire. By far the largest proportion of these have a rating of G (Table 16).

This must be viewed as a target to improve energy efficiency overall in East Dunbartonshire.

Table 16: Non-domestic EPCs in East Dunbartonshire

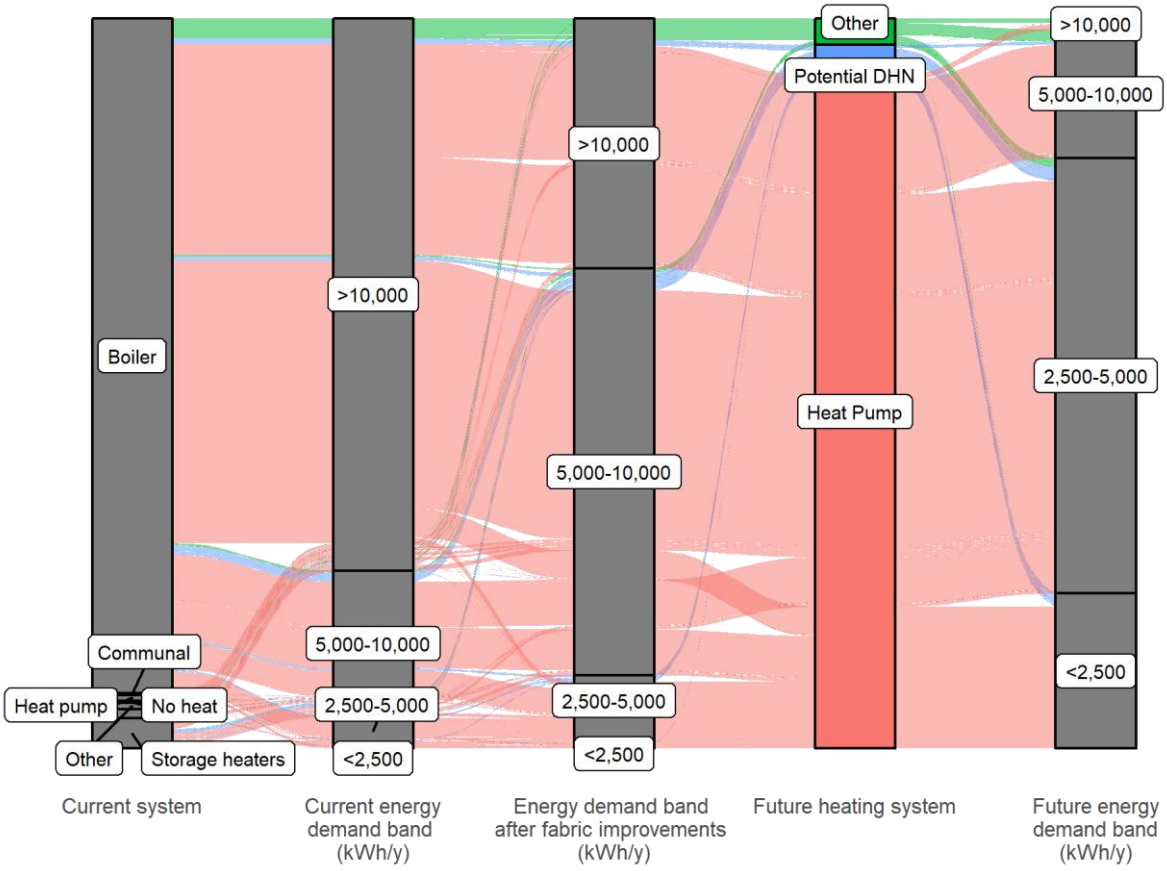
EPC Rating	Count	Percentage
A	10	2%
B	16	3%
C	64	11%
D	66	11%
E	95	16%
F	97	16%
G	258	43%

9. Pathways for all of East Dunbartonshire

9.1 Decarbonisation of Heat Pathway

The journey to the decarbonisation of each domestic property in East Dunbartonshire is shown in Figure 48. The first column shows the proportions of properties which have each heating system today. The second groups the properties by their total heat demand, in kWh/year. The third column assumes reasonable energy efficiency measures have been applied and groups the properties by their improved heat demand. The suitability of each property for each of the low carbon heat measures is then shown. This assumes all listed heat network zones are developed but doesn't consider further expansion. **It can be seen clearly that heat pumps are the most suitable technology for the vast majority of homes**. Finally, the column on the right shows the energy imported to the property to meet heat demand. For heat networks, this is simply heat purchased. For electric heating and heat pumps it is units of electricity.

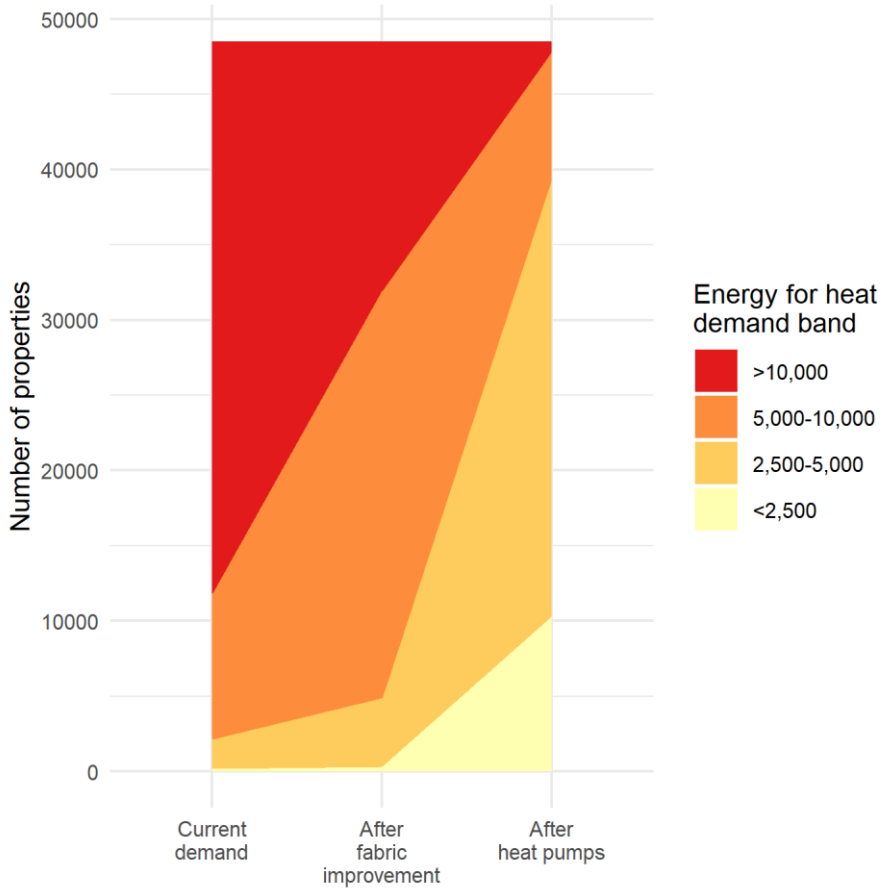
Figure 48: Decarbonisation and energy efficiency pathway – domestic dwellings



The shifting of individual properties down from one energy demand band to the next evident in Figure 48 is picked out in Figure 49. Energy efficiency improvements decrease the number of properties in the higher bands but the application of heat pumps (assuming a conservative Seasonal Coefficient of Performance (sCOP[60]) of 2.5) causes a much larger shift.

[60] sCOP is a measure of how efficient a heat pump system is over the course of a year (i.e., it evaluates the heat output and electricity input over an annual period).

Figure 49: Shifting energy demand by fabric improvement and heat pump installation, domestic



9.2 Heat Networks

The details in 7.6 highlight a number of areas around East Dunbartonshire which have potential to be developed into heat networks.

The suitability of the buildings for connection to heat networks is not known. Further work such as Building Assessment Reports (BARs)[61] and engagement with stakeholders is important to inform future decisions on these sites.

Even in the zones where heat networks are an option, there are differences between the domestic properties which are most likely to be suitable, such as blocks of flats, and properties which are less likely to be suitable, such as detached houses.[62]

Only the zone in Kirkintilloch (Figure 20) is recommended as being investigated further with the potential zone including several domestic dwellings.

When investigating this option further there are risks to consider, for example;

- When the Lenzie Academy is constructed, regulations are likely to require the inclusion of a low carbon heat source and that will likely happen before any network is developed. In that case, it would make some sense for the Council to consider supplying the leisure centre with heat from the new plant at the Academy. At that point, the remainder of the potential zone would be less attractive for commercialisation, as these loads would be considered critical to any network being developed in this area.

[61] Heat networks: Building Assessment Report (BAR) guidance - gov.scot (www.gov.scot)

[62] Detached houses may be considered to be less suitable to connect due to the individual sections of pipework that are required to connect the buildings to the network, on a linear heat density approach, the longer the connecting pipework, the "harder" the pipework has to work to satisfy loads.

- Although highlighted as a zone to consider, Figure 20 shows that there are very few areas of dense heat demand (i.e., areas where there are overlapping circles on either the stringent or baseline classification) – the low-density housing that exists between the larger / anchor loads mean that there could be lower income to the network, risking its commercial viability.
- There are several branches of wastewater pipework that run either adjacent to, or through this proposed area – though no waste-water treatment plant in the vicinity to make this a viable option for sourcing heat.
- The cost of implementing the network could be higher due to the need to cross water courses, including the canal and the river.
- Commercial properties, such as in the centre of Kirkintilloch, are less likely to be willing to make the long-term commitment required for a heat network connection. This risk the network being of relatively lower density than would be initially apparent.

The other small scale heat networks that are proposed, centred around EDC building stock are recommended solutions for these buildings, but not for connecting wider to include domestic dwellings. The heat network area focussed around Bearsden High School is marginal due to limited heat demand to make this commercially viable (as outlined in section 7.6.3.). It is worth noting that this contains several EDC properties and some care facilities (not EDC owned) and the housing surrounding this area is modern and is predominantly suited to individual heat pump systems. As outlined in Appendix F, Bishopbriggs and Milngavie also show marginal potential. However, there may be future opportunities if these areas attract denser developments that could contribute to a stronger, reliable heat demands.

9.3 Individual and Communal Heat Pumps

Of the technologies currently available to supply low carbon heat, heat pumps have been assessed **to be currently suitable for the vast majority of buildings**. Since the majority of properties are owner occupied, decisions on whether to install a heat pump and when to do so would be for individuals, however it appears that for most dwellings they are currently the most favourable technology.

Buildings that are suitable for communal systems (i.e., those where there are multiple dwellings, most suitable being those that have multiple dwellings all with the same owner (i.e., some EDC buildings or housing association buildings)) may benefit from communal heat pump solutions being implemented if agreement between tenants and owners can be agreed. Communal systems often resulting in lower overall capital and maintenance costs over the lifetime of the system – making them more economically advantageous compared to individual systems in each dwelling, but this will need assessed on a building-by-building level.

East Dunbartonshire Council will work with internal stakeholders to consider the most appropriate low carbon heating system for properties that it owns as well as working closely with social landlords to share the latest information on issues such as: good practice; communication with tenants prior to installation; sharing information with tenants on how to operate systems which have been installed; peer to peer support within the community; and the role of the advice services in supporting tenants.

The Council set out the actions to support the implementation of this Strategy in the accompanying Delivery Plan.

9.4 Non-domestic properties

The pathway to decarbonisation of non-domestic properties in EDC is complex, depending on ownership and heat use. The data that the LHEES is built-upon for non-domestic buildings is not as good quality as the domestic dataset and as such, it is harder to pull clear conclusions against the building stock. The general route to decarbonisation and EDCs role in influencing this is still relatively straightforward to outline.

The best data and knowledge of building stock lies in the Council owned buildings – and plans for decarbonising these buildings are either being developed or are in development.

9.4.1 Council owned properties

There are already decarbonisation studies being undertaken for many of the Council owned properties; these will inherently focus on electrification of heat utilising a number of technologies including heat pumps.

There are opportunities to connect some Council buildings together to form small communal scale heat networks. This needs careful planning and will likely be based on proposed upgrades to the buildings and their existing heating systems. The opportunity to connect several buildings together is not a sensible approach if one of the buildings has been singularly decarbonised, for example.

There are already some biomass fuelled buildings, which do not need a decarbonised heat source to be installed.

A prioritisation list should be drawn up between the various Council owned buildings based on their longevity (i.e., those that are to be closed or services pulled together are unlikely to be top of that list), existing boiler age and condition and whether or not that building is to be renovated or not.

There exist some public sector funding schemes such as PSDS[63] that can be used to support heat decarbonisation in the built environment (refer Appendix M for funding options currently available). A watching brief should be kept for identifying current and future funding opportunities that may be made available to the Council.

9.4.2 Privately owned properties

Whilst harder for the Council to engage and influence, data shows that there are many buildings that are already electrically heated. Whilst analysis based on EPC grade has not been undertaken in this Strategy, electrically heated properties have typically high EPC grades due to the high carbon factor used in SBEM (the program used to generate EPCs). The methodology and carbon factor are set to change, meaning that – without making any changes to these buildings, those that are electrically heated will see improvements in their EPC scores.
The focus moving forward should be on **on-gas** buildings that are > 100m^2 in floor area – these may not have an existing decarbonisation plan in place – and there are a variety of different building types that fit into this category – meaning that the technical solutions will vary across these buildings.

[63] https://www.salixfinance.co.uk/scotlands-public-sector-heat-decarbonisation-fund

10. Pathways for Strategic Zones

10.1 Strategic Zones

As described in 7.2, the existing Community Council boundaries are used as the LHEES Strategic Zones. These are:

- Baldernock
- Bearsden East
- Bearsden West
- Bearsden North
- Bishopbriggs
- Campsie
- Kirkintilloch
- Lenzie
- Milngavie
- Milton
- Torrance
- Twechar
- Waterside

The following sub-sections show the decarbonisation pathways for domestic dwellings within the strategic zones. They are presented as Sankey diagrams to illustrate the route to decarbonisation and do not show the measures on an individual dwelling basis. The Sankey diagrams are shown with the following attributes, moving left to right:

- **Left column**
  - Current heating technologies
- **Second column**
  - Current heating energy demand, shown as kWh/m^2/year
  - These are banded in the following way
    - < 100 kWh/m^2/year
    - 100-160 kWh/m^2/year
      - 160 kWh/m^2/year is the limit we have placed on our heat pump suitability mapping
    - 160- 200 kWh/m^2/year
    - > 200 kWh/m^2/year
- **Third column**
  - Future heating energy demand, shown as kWh/m^2/year – **post-fabric upgrades**
  - With the same banding as column 2
- **Right column**
  - Future heating technology
    - Heat pumps (which could be individual and communal are combined)
    - District heating system
    - “other”
      - High-temperature heat pumps (individual and communal)
      - Heat pumps with additional supporting works, such as upgrade of electricity supply to 3-phase, or more costly upgrades to distribution systems than is standard

- Air to air heat pumps (air conditioning)
- Direct electric
- Biomass (some rural cases)

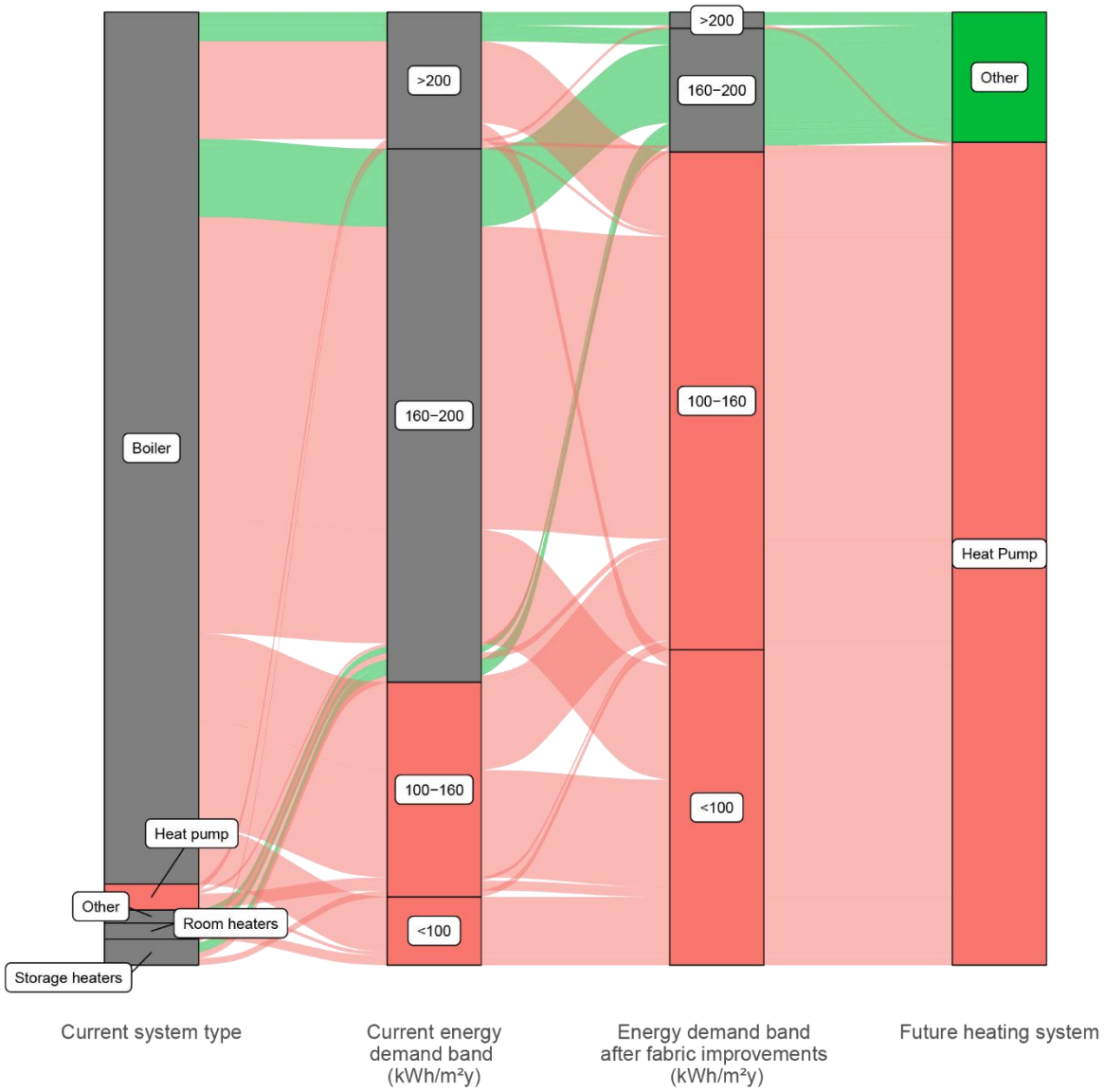
10.2 Baldernock

Figure 50 depicts all domestic properties within the Baldernock area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

Baldernock has a high proportion of properties which may require “Other” heating systems and these may be three-phase heat pumps, for example. In fact, a small number of properties with heat demands >200 kWh/m²y already have heat pumps.

There are no proposed heat network zones in this Strategic Zone.

Figure 50: Decarbonisation pathway for domestic properties in Baldernock

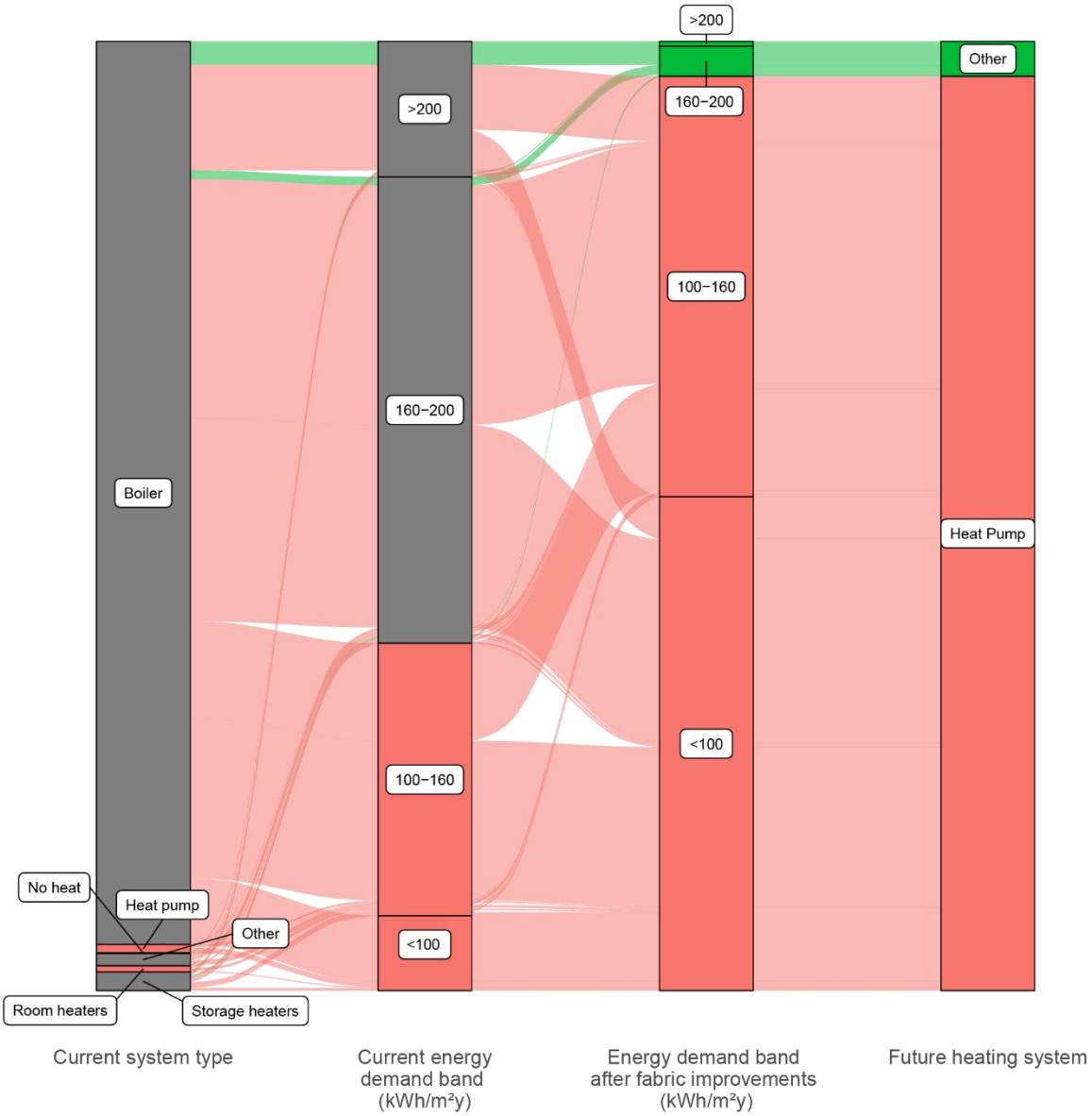


10.3 Bearsden East

Figure 51 depicts all domestic properties within the Bearsden East area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 51: Heat decarbonisation pathway for Bearsden East

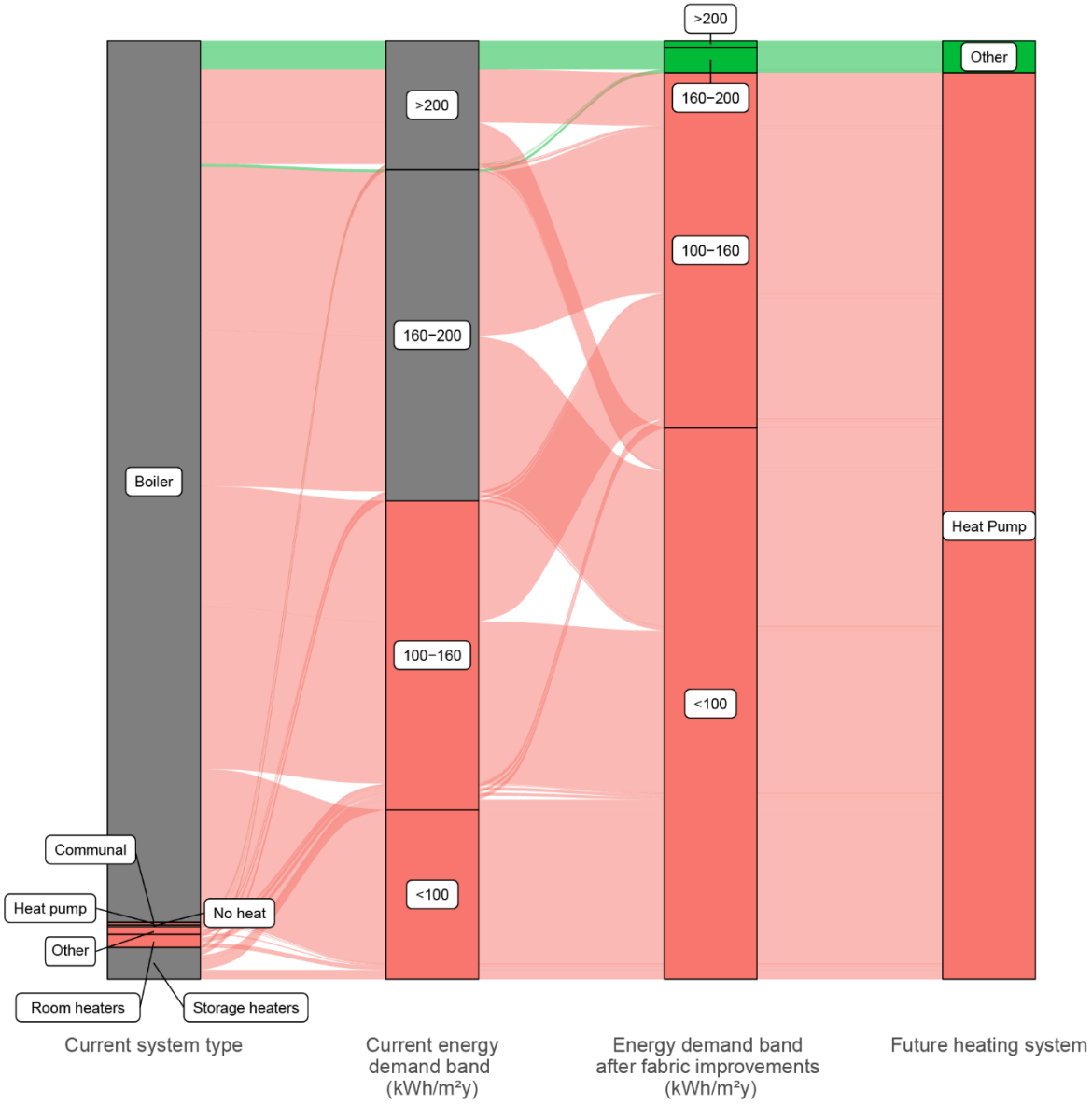


10.4 Bearsden West

Figure 52 depicts all domestic properties within the Bearsden West area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 52: Heat decarbonisation pathway for Bearsden West

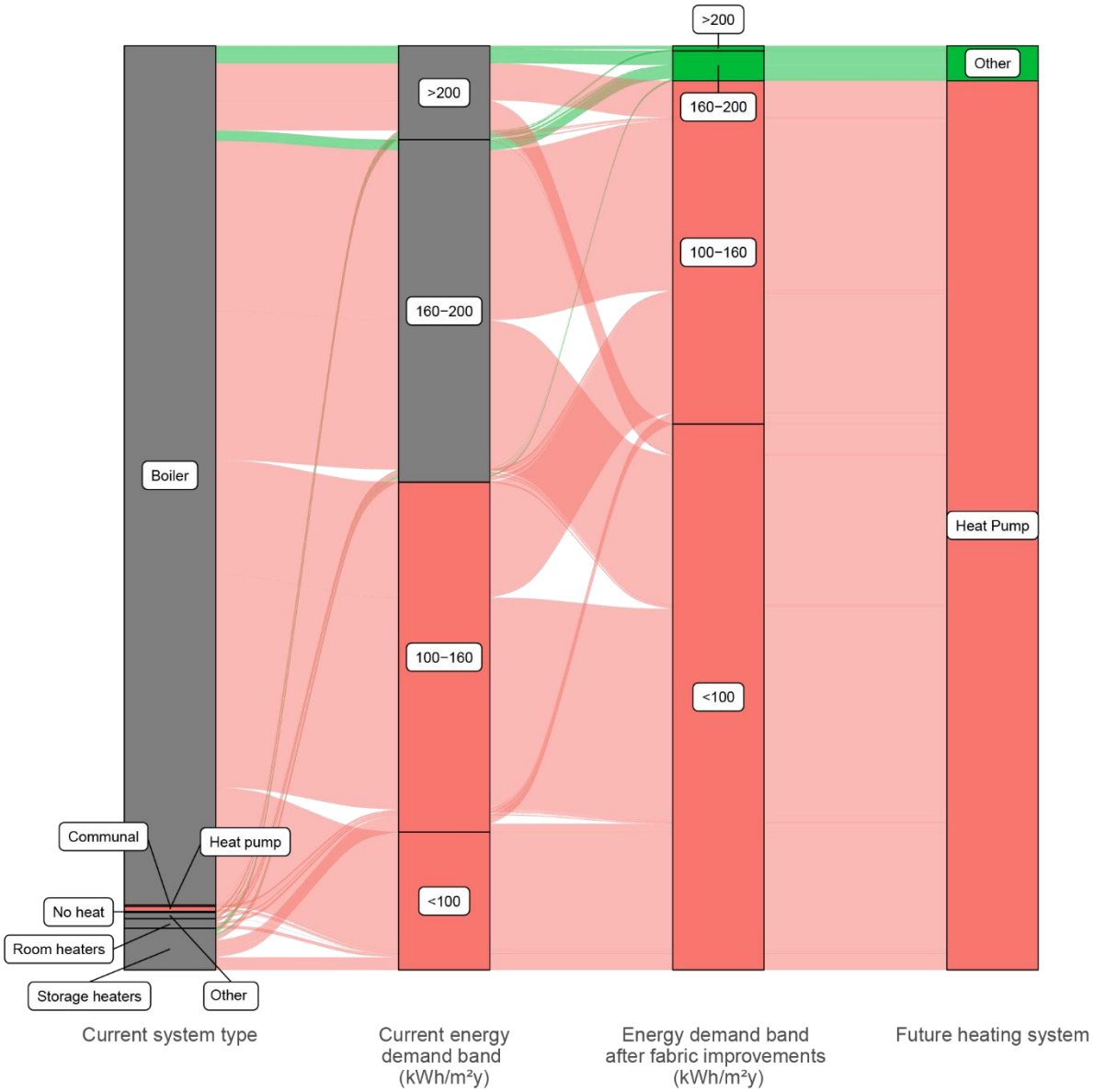


10.5 Bearsden North

Figure 53 depicts all domestic properties within the Bearsden North area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are a small number of significant heat demands and anchor loads which could be connected to one another as discussed in section 7.6.3. (refer Figure 19). However, this opportunity is unlikely to include adjacent domestic properties due to their low heat demands and low heat density. Therefore, the limited number of domestic properties adjacent to these anchor loads have not been highlighted as suitable for a district heat network.

Figure 53: Heat decarbonisation pathway for Bearsden North

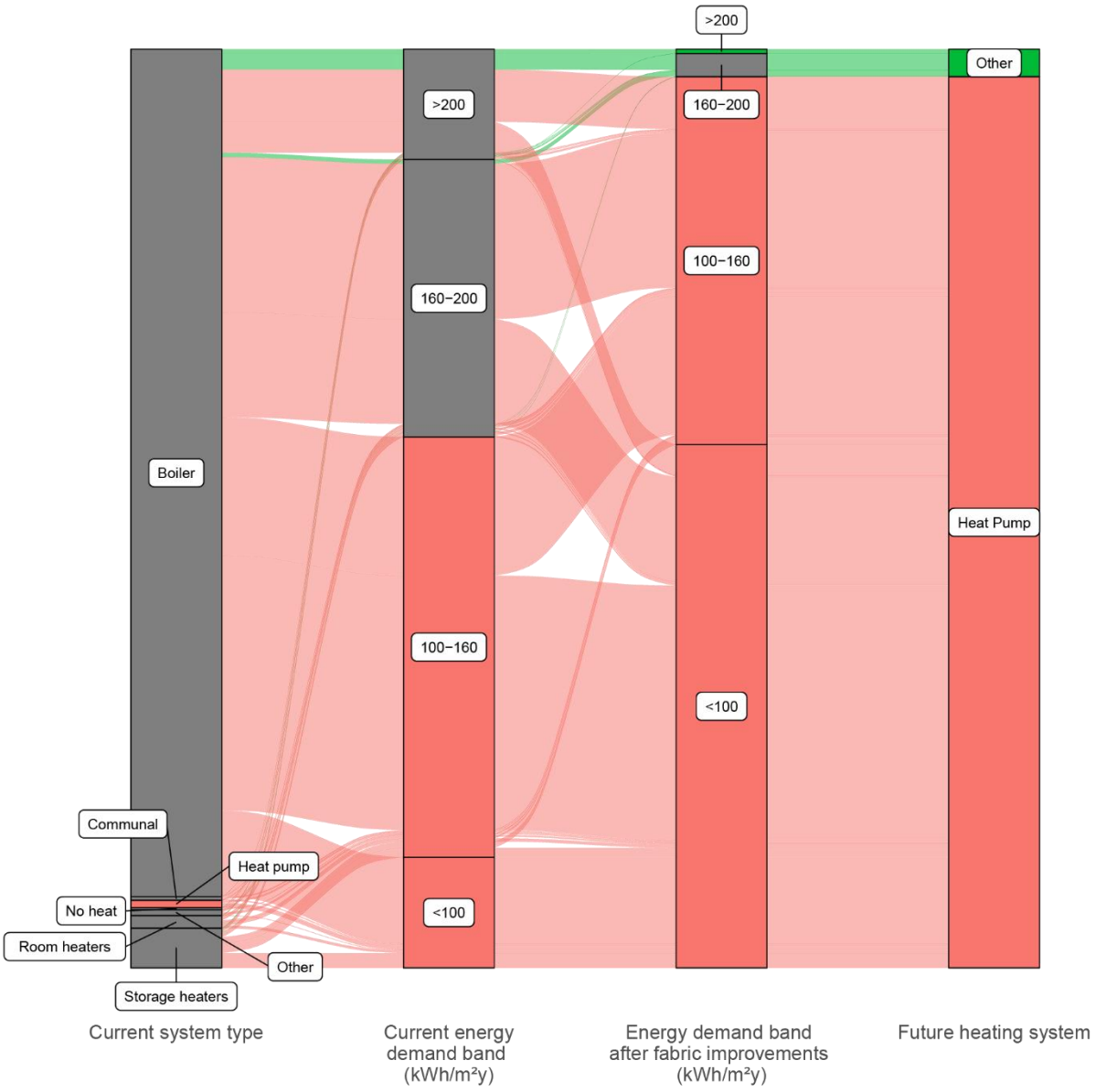


10.6 Bishopbriggs

Figure 54 depicts all domestic properties within the Bishopbriggs area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are several significant heat demands and potential anchor loads across the area (Figure 65 – Appendix F). However, the linear heat density analysis shows there is not a continuous area with a significant heat demand which represents a potential heat network zone.

Figure 54: Heat decarbonisation pathway for Bishopbriggs

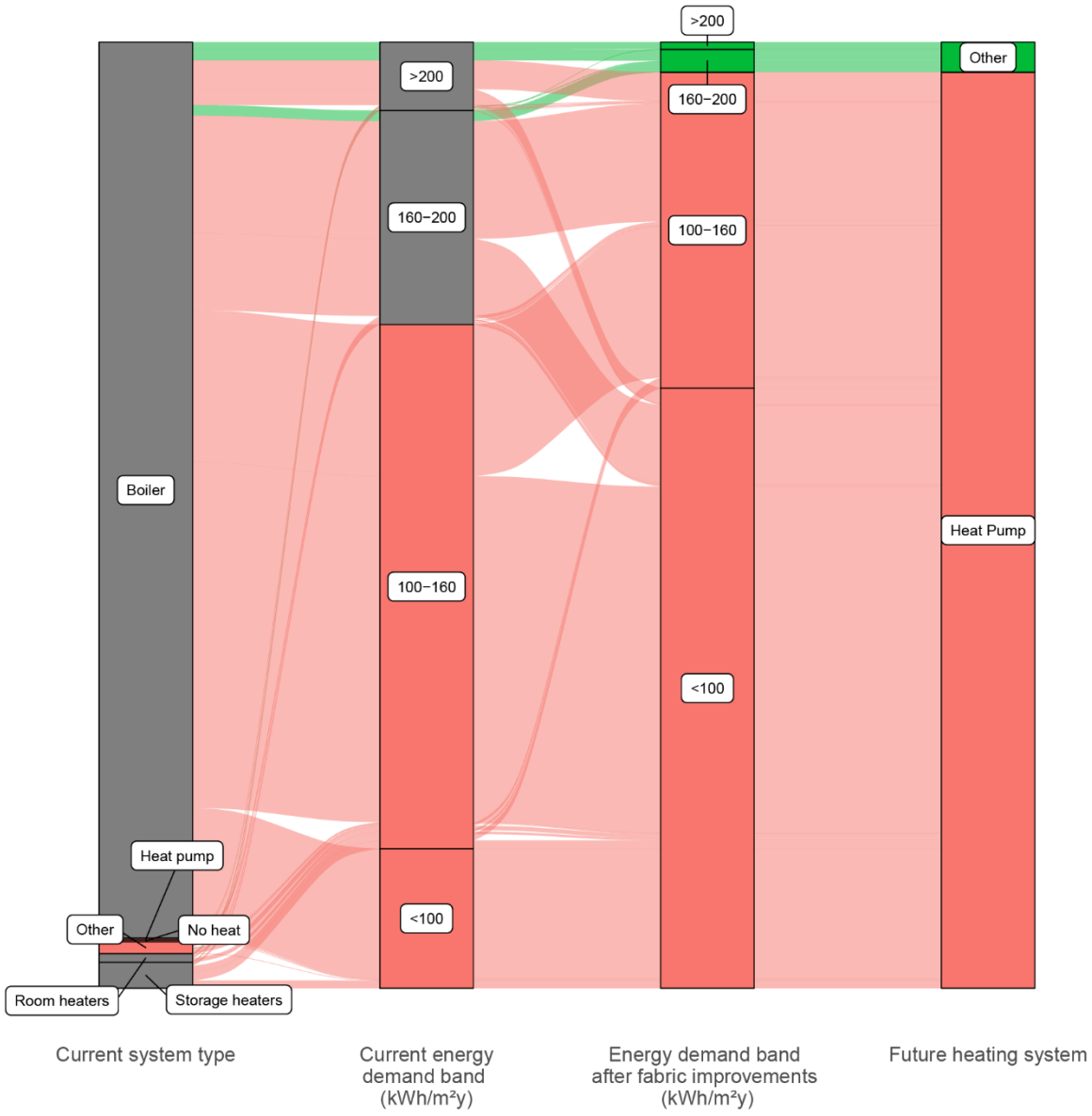


10.7 Campsie

Figure 55 depicts all domestic properties within the Campsie area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 55: Heat decarbonisation pathway for Campsie

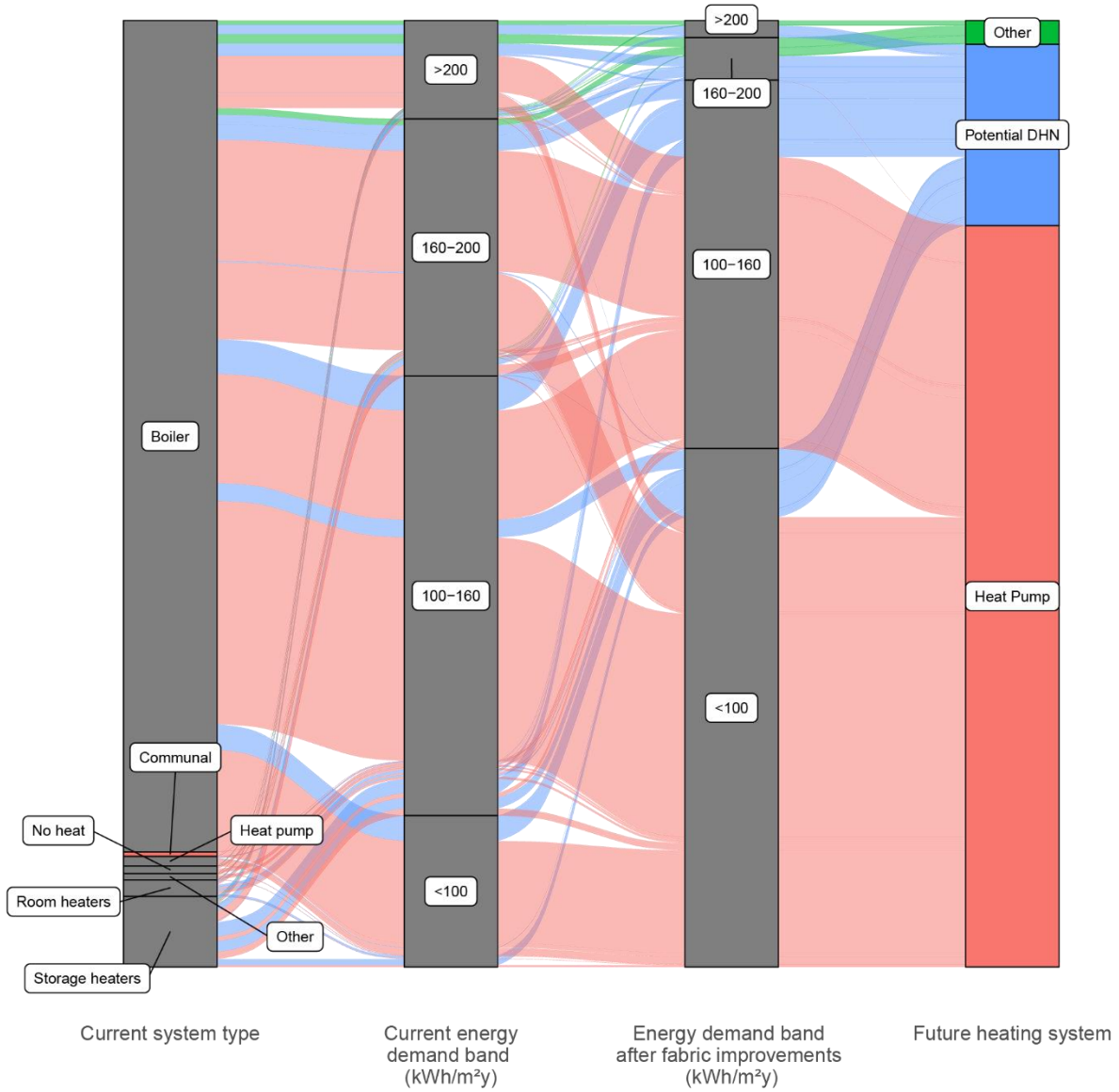


10.8 Kirkintilloch

Figure 56 depicts all domestic properties within the Kirkintilloch area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

Around 1,700 domestic properties are located in the zone which is recommended for further study as a potential heat network zone, shared between the Kirkintilloch and Lenzie Strategic Zones. Around 1,200 of those are currently using gas, so this would be a primary decarbonisation route and about 120 are expected to have a demand in excess of 200 kWh/m²y making them difficult for heat pumps.

Figure 56: Heat decarbonisation pathway for Kirkintilloch

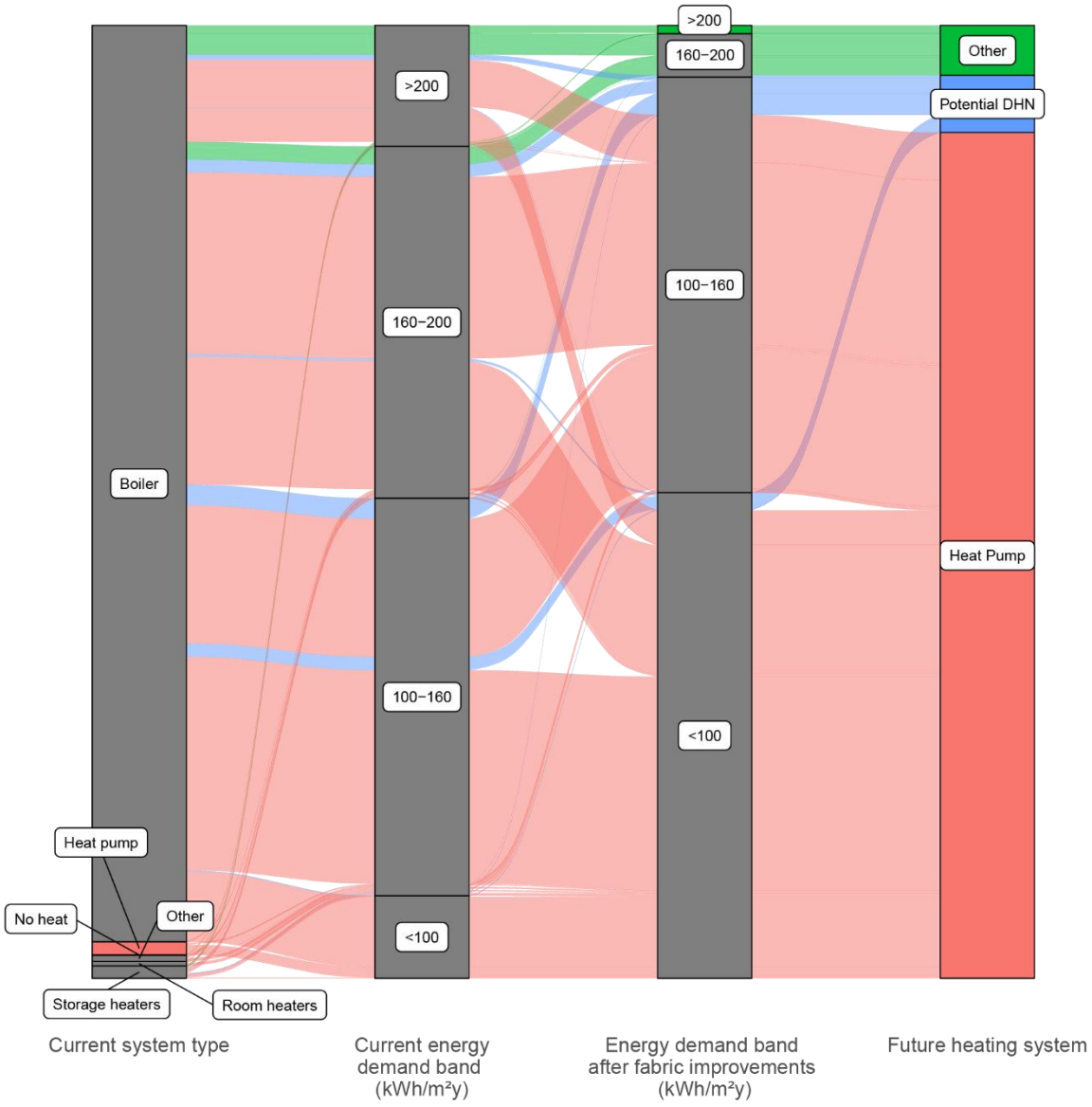


10.9 Lenzie

Figure 57 depicts all domestic properties within the Lenzie area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are around 260 properties are located in the zone which is recommended for further study as a potential heat network zone, shared between the Kirkintilloch and Lenzie Strategic Zones. Around 1,200 of those are currently using gas, so this would mean decarbonisation and about 120 are expected to have a demand in excess of 200 kWh/m²y making them difficult for heat pumps.

Figure 57: Heat decarbonisation pathway for Lenzie

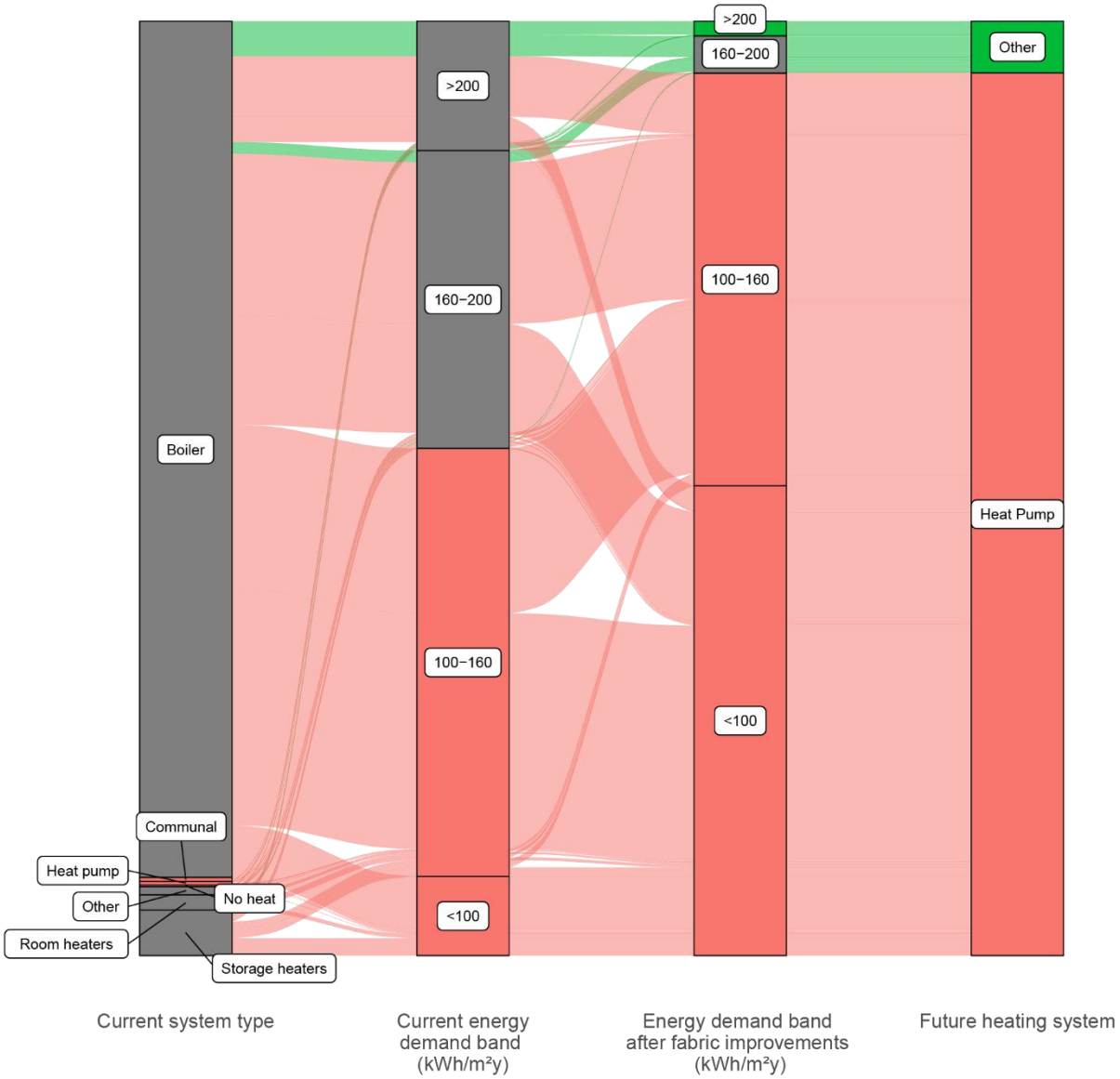


10.10 Milngavie

Figure 58 depicts all domestic properties within the Milngavie area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are several significant heat demands and potential anchor loads across the area (Figure 64 – Appendix F). However, the linear heat density shows that there is not a continuous area with a significant demand which represents a potential heat network zone.

Figure 58: Heat decarbonisation pathway for Milngavie

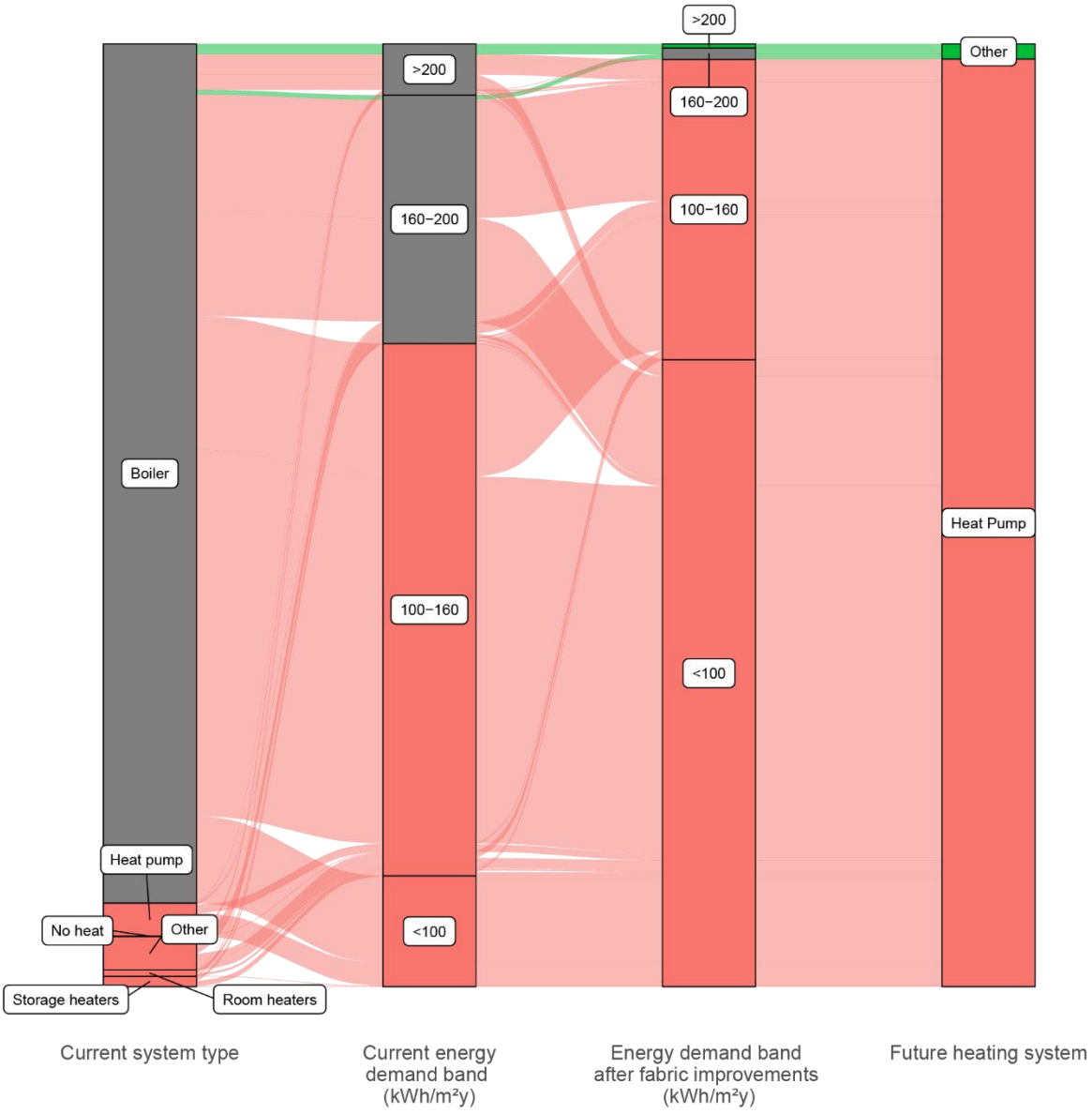


10.11 Milton

Figure 59 depicts all domestic properties within the Milton area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 59: Heat decarbonisation pathway for Milton

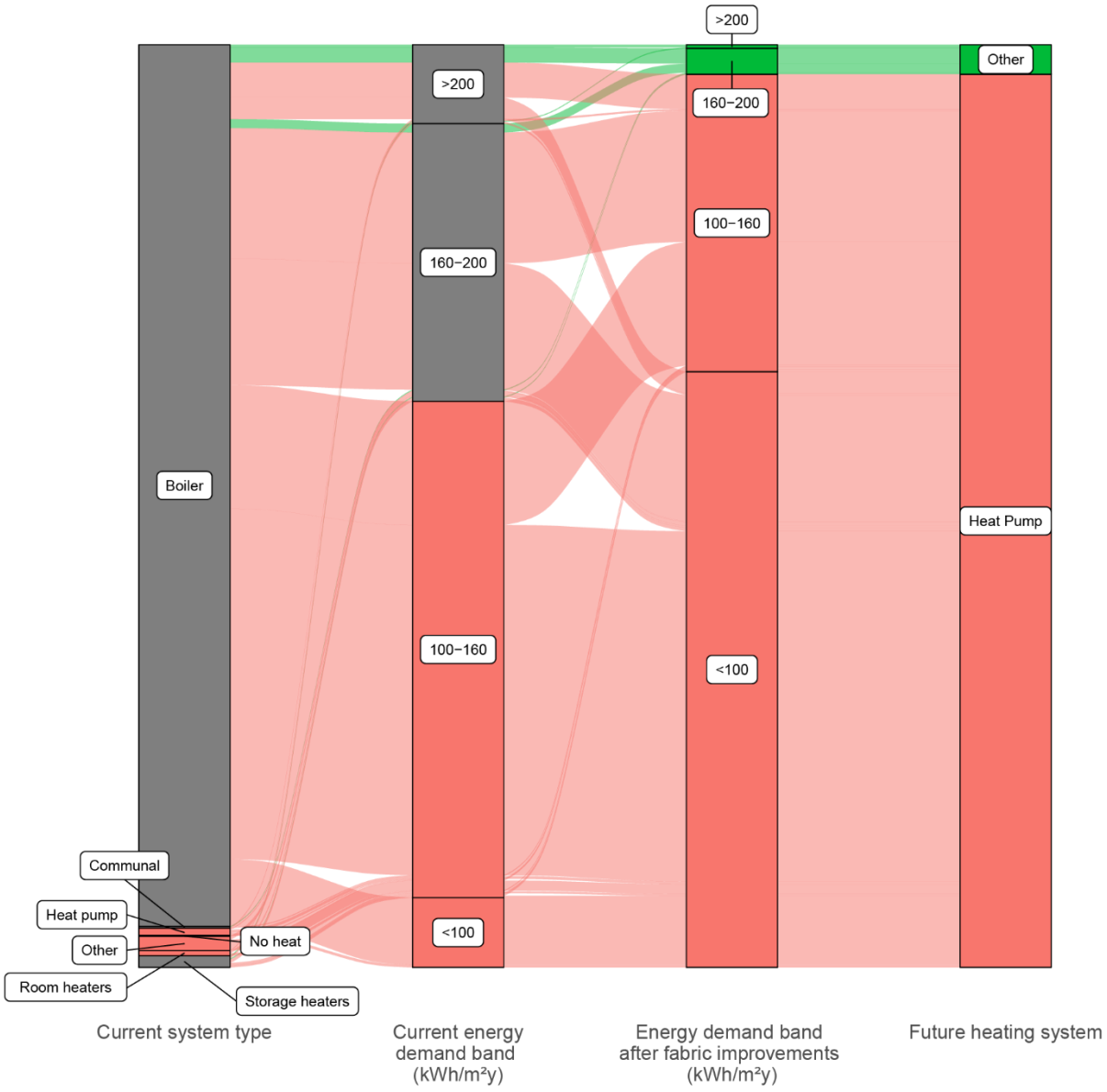


10.12 Torrance

Figure 60 depicts all domestic properties within the Torrance area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 60: Heat decarbonisation pathway for Torrance

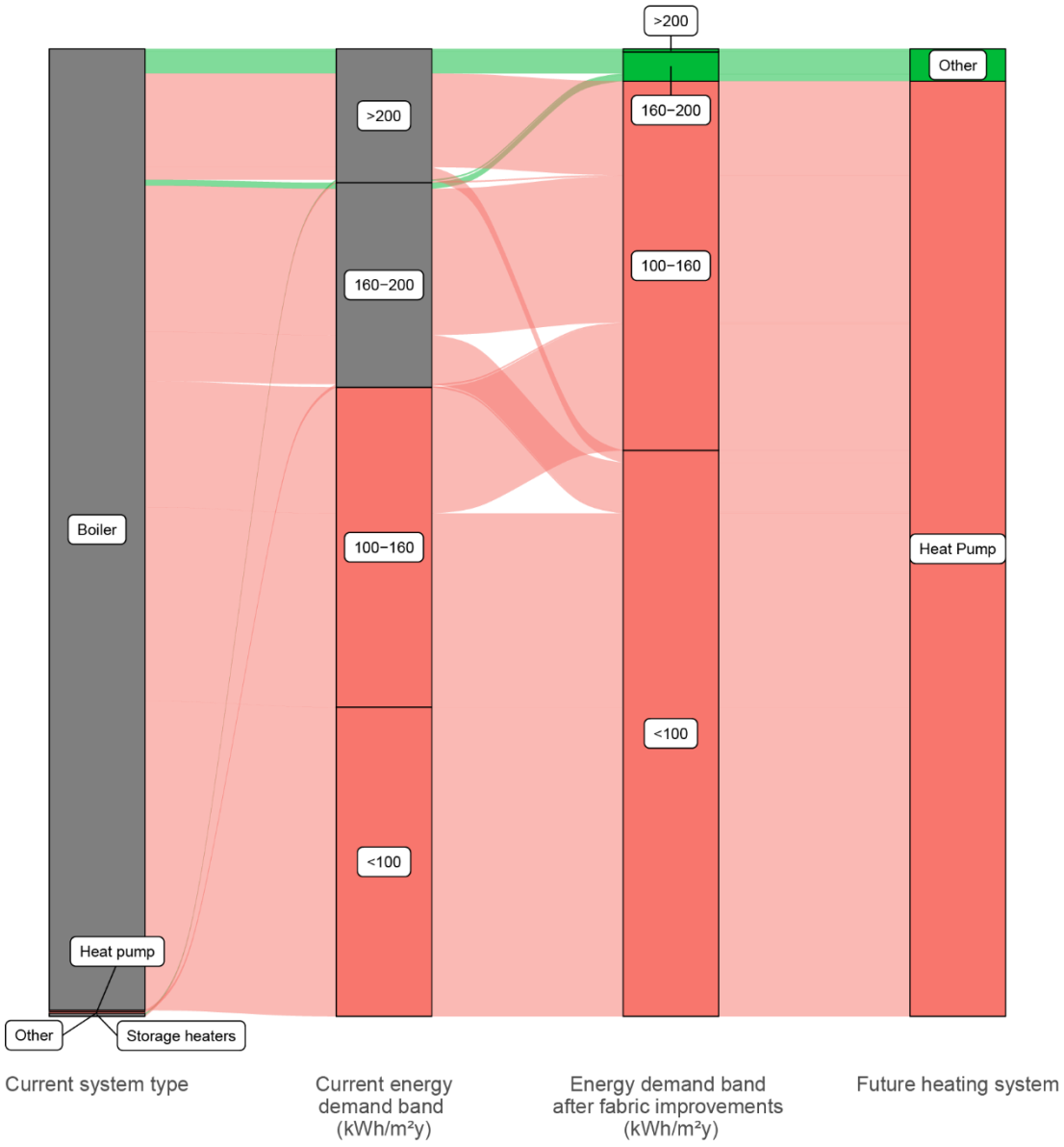


10.13 Twechar

Figure 61 depicts all domestic properties within the Twechar area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 61: Heat decarbonisation pathway for Twechar

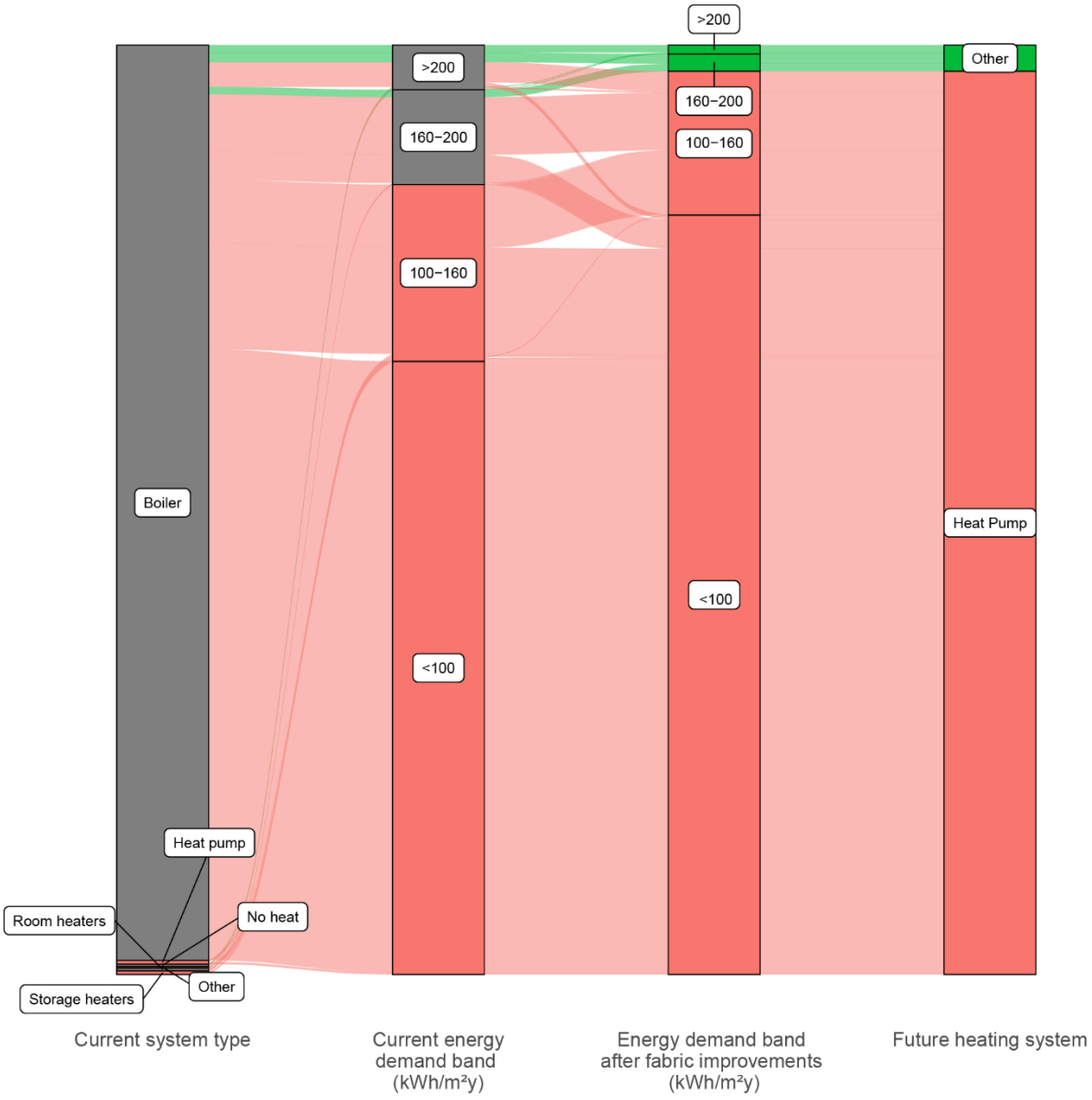


10.14 Waterside

Figure 62 depicts all domestic properties within the Waterside area and, from the left, the heating system each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property.

There are no proposed heat network zones in this Strategic Zone.

Figure 62: Heat decarbonisation pathway for Waterside



11. Conclusions

The analysis shows that for East Dunbartonshire to meet the two main objectives of decarbonising heat and reducing fuel poverty caused by poor energy efficiency a combination of measures is required and possible.

Of the 48,501 domestic properties in East Dunbartonshire, 27,272 are likely to be suitable for heat pumps retrofits today. This rises to 43,224 properties with basic fabric improvements applied. Building owners and occupiers may choose other technologies, however heat pumps are the technology likely to have the biggest impact in decarbonising heat. Actions to support the roll-out of heats pumps are considered in the delivery plan.

There is one potential heat network zone in Kirkintilloch. The Council will investigate whether the area could benefit from the development of district heating networks in accordance with the Heat Network Act, and consider if they can provide reliable low carbon heat at a reasonable cost.

A number of small clusters of buildings were identified, particularly Council owned buildings, which could have heat networks between them. The Council will investigate further the potential of these smaller networks.

Fuel poverty rates in East Dunbartonshire are lower than the Scottish average. This strategy identifies delivery areas where there is potential to reduce fuel poverty through prioritised energy efficiency interventions.

The strategic approach will be:

1) Insulation of buildings where practical.
2) Support development of district heating networks where they can provide reliable low carbon heat at a reasonable cost, in accordance with the Heat Network Act. Initially this will focus on progressing a study into feasibility of Kirkintilloch area as a possible heat network zone.
3) The Council will consider the suitability of smaller heat networks serving specific clusters of Council buildings, such as the opportunity to connect Bearsden Academy to the Primary School and possibly 2 nearby care homes.
4) Encourage deployment of individual or communal heat pump systems which deliver reliable heat at a reasonable cost.
5) Decarbonise the Council's non-domestic buildings:
    a. In areas where district heating may be an option – consider being a customer or a supplier of heat.
    b. In areas where district heating unlikely – identify alternative decarbonisation pathways – this is still likely to be developed based on heat-pump technologies
6) Work with businesses to develop their decarbonisation plans.
7) Collaborate with organisations supporting fuel poverty alleviation, housing associations, registered social landlords and support measures to decarbonise the private sector (engaging with landlords and owner occupiers) for area-based (through priority delivery projects) and area-wide actions.
8) Support economic development and inward investment through identification of heat opportunity areas.

Appendices

Appendix A Index of Tables and Figures

Table of Figures

Table of Tables

Appendix B Legislation Relating to LHEES

Table 17: Summary of policy and legislation

UK-Wide
The Climate Change Act 2008 (2050 Target Amendment) Order 2019 Net Zero GHG Emissions by 2050.
Heat Network (Metering and Billing Regulations) 2014 Heat network operators must submit notifications for the heat networks they run and, where required (as identified by a cost-effectiveness tool), must install metering devices to accurately charge end-users for their energy consumption.
The 25 Year Environment Plan (2018) Boosting the long-term resilience of homes, businesses and infrastructure. New homes are proposed to be built in a way that reduces energy and material resource demand, while minimising overheating.
The Ten-Point Plan for a Green Industrial Revolution (2020) Implementing the Future Home Standard with an aim for 600,000 heat pump installations per year by 2028. Provides funding through Green Homes Grant, Homes Upgrade Grant (targeting off-gas grid homes), Social Housing Decarbonisation Fund and Public Sector Decarbonisation Scheme. The Energy Company Obligation is extended to 2026 to support households that are most vulnerable to fuel poverty and poor energy efficiency.
Net Zero Strategy (2021) & Heat and Buildings Strategy (2021) Creating a market-based mechanism for low-carbon heat and reinforcing electricity networks to accommodate increases in heat pumps. This also supports Hydrogen trials and Hy4Heat research programme with aims to finalise a standard for low-carbon hydrogen in 2022.
UK Climate Change Risk Assessment 3 (2022) This is the 3rd 5-yearly assessment, as required by the Climate Change Act 2008 and statutory advice provided by the Climate Change Committee (CCC). It outlines risks to human health, wellbeing and productivity from increased exposure to heat in homes and other buildings; ensuring a resilient and secure energy supply through improved UK energy infrastructure, networks and assets while avoiding maladaptation of individual assets through leadership by the UK government.
Energy Act 2023 Low-carbon heat schemes and hydrogen grid trials; the Government committed to doubling its UK ambition for hydrogen production to up to 10GW by 2030, with at least half of this from electrolytic hydrogen. Further actions include: making provisions about energy production and security and the regulation of the energy market, including the energy performance of premises; establishment of a future systems operator which will have control over the electricity system and gas system; regulations for heat networks and designated heat network zones; competition within the electricity and gas markets to better serve the ultimate consumer; the storage, transport and capture of carbon and the decommissioning of carbon storage installation.
Programme for Government (2023-24) Sets out how the SG continue to drive down emissions, prioritising changes to how homes are heated to be greener and cleaner. Embedding fairness to how the housing market works and supporting community-led rural housing initiatives are also highlighted.
UK Net Zero Carbon Buildings Standard (in development) The Standard will set out performance evaluation metrics and targets, such as such as energy use including space heating/cooling demand and peak load, as well as upfront and lifecycle embodied carbon. Development of the standard was initiated in May 2022 and is expected to be tested in 2024.

National – General
Climate Change (Scotland) Act 2009 Public bodies have a duty to contribute to Scotland's national emission reduction target.
Scotland's Sustainable Housing Strategy (2013) Support delivery of energy efficient homes by 2030 through retrofit and new build, as promised in the Infrastructure Investment Plan. It includes the Home Energy Efficiency Programmes for Scotland (HEEPS) which has several key goals: end fuel poverty, lower fuel bills, lower emissions and increase economic growth, attracting companies to invest in energy efficiency.
Heat Policy Statement 2015 The Heat Policy Statement 2015 (HPS) is a policy statement targeting decarbonisation of heat and sets out how low carbon heat can reach more householders, business and communities and a clear framework for investment in the future of heat in Scotland. This aims to achieve 1.5TWh of Scotland's heat demand to be delivered by district or communal heating and to have 40,000 homes connected by 2020.
Making Things Last: A Circular Economy Strategy for Scotland (2016) This strategy facilitates lowering embodied carbon in buildings by through limiting material consumption (enabling more reuse and recycling at end of life for new builds and refurbishments) to reduce construction and demolition waste which represents about 50% of all waste in Scotland.
Scotland's Energy Strategy 2017 The 2050 vision is to make Scotland's energy delivery competitive for the local and national sector, secure, affordable, and clean in a socially and economically sustainable way as a whole-system and inclusive approach. It sets the following 2030 energy targets: 50% of Scotland's heat and energy to be supplied by renewable sources and 30% increase in productivity of energy use in the economy.
Energy Efficiency Scotland Strategy (2018) The 2032 targets include reduction of heat demand in domestic buildings' by 15% and in non-domestic buildings by 20% through building fabric improvements and 35% of domestic and 70% of non-domestic buildings heat to be supplied by low carbon technologies.
Scottish Government Climate Change Plan Update – Securing a Green Recovery on a Path to Net Zero (2020) This update to the Climate Change Plan (2018-2032) focuses on green recovery to deliver net zero ambitions following the Covid-19 pandemic. There is an emphasis on green jobs, adaptation, and tackling fuel poverty (to reduce households in fuel poverty below 5% and in extreme fuel poverty below 1%, by 2040). It sets out the pathway to decarbonise the buildings sector and heating in line with Climate Change Act; retrofit buildings and achieve ultra-high levels of fabric efficiency in new builds to support reducing fuel poverty to less than 5% by 2040 and highlights the need for at least 50% of Scotland's building stock to be heated using low or zero carbon technologies by 2030.
Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 Requires 75 % emissions reduction by 2030, 90 % emission reduction by 2040 (including the buildings sector), and net zero GHG emissions by 2045.
Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act (2019) The 2018 Fuel Poverty (Target, Definition and Strategy) (Scotland) Bill outlined a new target relating to eradicating fuel poverty or limiting to less than 5% by 2040 and provides a revised definition that reflects income levels and energy costs. The 2019 Fuel Poverty Act sets legislative interim targets for 2030 and 2035 and the necessary actions are outlined in the Fuel Poverty Strategy that was published in 2021. Following this, the Tackling Fuel Poverty in Scotland: A Strategic Approach was published in late 2021, which contains a strong focus on energy efficiency as a driver for fuel poverty.
Climate Ready Scotland: Scottish Climate Change Adaptation Programme 2019-24 The Adaptation Programme is a requirement by Section 53 of Climate Change (Scotland) Act 2009 and envisions for the built environment, supporting infrastructure and economy to be climate resilient. This has a strong focus on climate adaptation of all systems, inclusiveness for wider populations and a sustainable, flexible economy supported by strong international networks.

The Energy Efficiency (Domestic Private Rented Property) (Scotland) Regulations 2020 Private landlords must achieve EPC Band E from 1 April 2020 at a change of tenancy, and then EPC Band D from 1 April 2022 at a change of tenancy;
Heat in Buildings Strategy (2021) Sets out a pathway to zero emissions buildings by 2045 and includes the New Renewable Heat Target for 2030. These include, 68% reduction of GHG emissions from buildings by 2030 (compared to 2020 baseline), 22% of non-electrical heat to be from renewable sources by 2030z, heat networks to reach an output of 2.6 TWh by 2027 and 6 TWh by 2030, phasing out fossil fuel boilers by 2025 in off-gas properties and by 2030 in on-gas properties, new boilers being hydrogen-ready by 2026 and 50% of the building stock to use zero emission heating by 2030, such as heat pumps (reach 200,000 installations per year by the late 2020s).
Climate Emergency Skills Action Plan 2020-2025 (Skills Development Scotland / Scottish Government) (2020) Local authorities are lead partners on Priority Area 1: Supporting a green labour market recovery from Covid-19, and Priority Area 5: Ensuring fairness and inclusion in the skills system as part of a just transition to net zero.
Fuel Poverty Strategy (Tackling Fuel Poverty in Scotland: A Strategic Approach 2021) The fuel poverty strategy sets out policies and proposals for national government, local authorities and third sector partners to help meet the targets set out in the Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019.
The Heat Networks (Scotland) Act 2021 It encourages wider use of heat networks and was followed by the Heat Network Delivery Plan. The act targets for 2.6 TWh to be supplied by heat networks by 2027 and 6 TWh by 2030. By October 2023, Scottish Ministers were required to set a target for 2035. The Act places a duty on local authorities to conduct a review of areas likely to be particularly suitable for heat networks within its area. This introduces building assessment reports (BAR), heat network zones, licences, permits and consents processes amongst other regulations.
The Environment Strategy for Scotland: Initial Monitoring Framework (2021) Describes key desired outcomes, along with relevant indicators to monitor environmental impact, i.e. '*We play our full role in tackling the global climate emergency and limiting temperature rise to 1.5°C'*, with GHG emissions and Scotland's carbon footprint being key indicators. This complies with the United Nations Sustainable Development Goal 13 on climate action.
Infrastructure Investment Plan 2021/22-25/26 Decarbonising Heat and Boosting the Energy Efficiency of Buildings section highlights several pathways: Investments through Area Based Schemes (ABS) programme to provide whole house retrofits with zero/low carbon heating systems and microgeneration (e.g. solar PV) and energy efficiency measures; £200 million investment is available until 2026 through the Social Housing Net Zero Heat Fund for registered social landlords to help install zero emission heating systems and improve energy efficiency in social housing, including connections to district heat networks; Community and Renewable Energy Scheme (CARES), Emerging Energy Technologies Fund, Clyde Mission, Energy Transition Fund and Low Carbon Infrastructure Transition Programme have also made significant contributions to decarbonising building heating systems.
Heat Networks Delivery Plan Facilitates the implementation of heat networks in Scotland, as set out in the Heat Networks Scotland Act 2021 and wider policies, to eradicate fuel poverty. It links with the Heat in Buildings Strategy 202, New Build Heat Standard, LHEES, First National Assessment of Potential Heat Network Zones, Capital investment and funds, and is planned to be reviewed every 2 years.

Scottish Water Net Zero Route Map Scottish water has committed to being net zero by 2040 and the route map focuses on energy efficiency, low carbon construction and energy, storing unavoidable emissions and investing in renewable power technologies.
Scottish Government Hydrogen Action Plan (2022) Ambition of 5GW of hydrogen production capacity by 2030 and 25GW by 2045.
The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 Local Authorities should develop LHEES to set out the long-term plan for decarbonising heat in buildings and improving their energy efficiency across an entire Local Authority area in order to support Scotland's statutory targets for greenhouse gas emissions reduction and fuel poverty. The Local heat and energy efficiency strategies (LHEES) and Delivery Plans Guidance (2022) sets out the pathway to deliver statutory 2045 net zero targets and 2040 fuel poverty elimination targets. This includes identifying how the built stock should address poor energy efficiency as a driver of fuel poverty, strategic heat decarbonisation pathways and zones and priority delivery areas for the LHEES.
Draft Energy Strategy and Just Transition Plan (2023) It sets the ambition for "more than 20GW of additional renewable electricity on-and offshore by 2030; for hydrogen to provide 5 GW or the equivalent of 15% of Scotland's current energy needs by 2030 and 25 GW of hydrogen production capacity by 2045; generation of surplus electricity to support decarbonisation across Europe; energy security through storage, etc.". There are proposals for investing over £1.8 billion in decarbonising homes and establishing 2 GW of community owned energy by 2030.
Building (Scotland) Amendment Regulations 2023 Sets out the New Build Heat Standard to eliminate installation '*direct emissions heating systems'* in domestic or non-domestic new builds from 2024*;* requires the use of SAP 10 for EPC production for new dwellings (updated emission factors for electricity.
New Build Heat Standard 2024 New build housing will be subject to the New Build Heat Standard from 2024 through the Building (Scotland) Amendment Regulations 2023. The NBHS will prohibit the use of direct emissions heating systems in new buildings applying for a building warrant from 1 April 2024 onwards. All new installed heating systems must be zero direct emissions heating systems from that date.
The Heat Networks (Heat Network Zones and Building Assessment Reports) (Scotland) Regulations 2023 Makes provisions under the Heat Networks (Scotland) Act 2021 specifying how local authorities shall publish review statements on heat network zones, who must be consulted, and when a building assessment report must be undertaken. This includes identifying potential areas for Heat Network Zones (HNZs) within East Dunbartonshire and this will be done through both the development of the LHEES and the production of the Heat Network Review Statement.
Scottish Government National Outcomes The National Outcomes describe what 'living well together' means for Scotland, from protecting the environment, to being healthy and active; with communities that are inclusive, empowered, resilient and safe, to tackling poverty by sharing opportunities, wealth and power more equally. Whilst the CAP will link to a number of the 11 National Outcomes directly and indirectly, this section most relates to the Environment and the Economy.
Scotland Energy Efficiency Programme (SEEP) SEEP will be a coordinated programme to improve the energy efficiency of homes and buildings in the commercial, public and industrial sectors and to decarbonise their heat supply, with an initial estimated overall investment in excess of £10 billion.
Planning Legislation and Regulations The Town and Country Planning (Development Planning) (Scotland) Regulations 2023 outline the planning framework from a national to local level in the requirement for the production of the Local Development Plan (LDP). The Town and Country Planning (Scotland Act 1997 as amended by the Planning (Scotland) Act 2019 gives National Planning Framework (NPF 4) an enhanced status as part of the development plan. The

Development Plan must incorporate multiple policies and requirements, which align with and deliver the objectives of the CAP.

Scotland's fourth National Planning Framework (NPF4)

Encourages the reuse of brownfield, vacant and derelict land for new developments.

- Policy 1 – When considering all development proposals significant weight will be given to the global climate and nature crises.
- Policy 11 – Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported.
- Policy 18 & 19 – Development proposals within or adjacent to a Heat Network Zone identified in a LDP will only be supported where they are designed and constructed to connect to the existing heat network.

Housing to 2040

The aim is for everyone to have a safe, high-quality home that is affordable and meets their needs in the place they want to be. It will,

- Attract private investment to help deliver more energy-efficient homes that area adapted to climate change and use zero emissions heating;
- Take a place-based approach and improve the housing system (through continued investment) to ensure affordability and quality of homes, especially for those in need;
- All new homes delivered by Registered Social Landlords and local authorities will be zero emissions by 2026;
- By 2045, the Government will adapt and retrofit existing homes so occupants can benefit from improved energy efficiency and decarbonised heating.

The Environment Strategy for Scotland

Sets out the Scottish Government's commitment to ensuring Scotland plays its full role in tackling the climate and nature emergencies.

- Provides an assessment of current progress in Scotland towards a net zero, nature positive, circular economy
- Provides a Theory of Change approach is undertaken to map out the key intermediate outcomes on the pathway to a net zero, nature positive, circular economy, and to identify how existing policy levers could go further, or new policy levers could be adopted, to steer the economy of Scotland onto a more direct path to achieving these goals
- Makes extensive recommendations for how the set of available policy levers can be applied more effectively to move towards a net zero, nature positive, circular economy
- Allocate funds that are commensurable with Scotland's ambitious targets to decarbonise the building stock. For example, Germany's Climate and Transformation Fund allocates an equivalent of more than three times per capita annual funding to building retrofit than the commitment in Scotland's Heat in Buildings Strategy

National – Public Sector Specific

Local Government in Scotland Act 2003

Places a duty on Local Authorities to obtain best value and to contribute to sustainable development.

Procurement Reform (Scotland) Act 2014

Publicly funded bodies must set out in their Annual Procurement Strategy how they will use procurement to address negative environmental impacts and report progress in their annual Procurement reports. This needs to explicitly address climate change and circular economy.

The Climate Change (Duties of Public Bodies: Reporting Requirements) (Scotland) Amendment Order 2020

Public bodies must report in their Public Bodies Climate Change Duties (PBCCD) Annual Reports, where applicable, "targets for reducing indirect emissions of greenhouse gases" (Indirect emissions include supply chain emissions) and how they align their spending plans and use of resources to contribute to reducing emissions and delivering emissions reduction targets and report on this from March 2022. Public Bodies Climate Change Duties Report Update 2024 (upcoming) aims to mandate local authorities to report scope 3 emissions.

Scottish Government and Scottish Green Party: draft shared policy programme (2021)

Requires all "publicly owned buildings to meet zero emission heating requirements, with a backstop of 2038." This implies that most buildings would be decarbonised well before that. The programme commits to "a series of phased targets" for decarbonisation of public sector buildings starting in 2024. This will be driven through building standards/Heat in Buildings Regulations. In addition, "all new buildings where a building warrant is applied for from 2024 must use zero emissions heating as the primary heating source and meet significantly higher energy efficiency standards".

Public Sector Leadership on the Global Climate Emergency (2021)

Sets targets to "decarbonise estate by 2038 at the latest, with zero carbon direct emissions from all buildings" and reduce fugitive emissions to absolute zero by 2045, where possible. Public sector bodies must set emissions reduction targets for indirect emissions (such as business travel). New constructions are encouraged to comply with the net zero building standard.

Regional Policies

Glasgow City Region Economic Strategy & Action Plan (2021)

Key priorities are to develop resilience to protect the Region's homes and economic assets; reduce infrastructure emissions through developments such as a £20 million District Heating Network and a large-scale water source heat pump scheme that extracts water from the Clyde to generate heat for buildings surrounding it.

Clydeplan: Glasgow & Clyde Valley Strategic Development Plan 2017

Has a strategic objective to deliver low carbon heat and power, and associated infrastructure. Policy 10 covers delivering heat and electricity and requires local development plans to undertake heat mapping and support infrastructure to deliver renewable heat and energy. It also "supports re-use of waste heat and the co-location of uses within business environments which support the integration of efficient energy and waste innovation". This policy no longer forms part of the development plan and will eventually be replaced by a new Regional Spatial Strategy (RSS) - in development.

Glasgow and Clyde Valley: Climate Ready Clyde Adaptation Strategy and Action Plan 2021

Sets out the following intervention:

- Strategic Intervention 8 - Ensure everyone's homes, offices, buildings and infrastructure are resilient to future climate impacts;

and the following flagship actions as physical interventions:

- Flagship Action 6 - climate resilient principles and guidelines.
- Flagship Action 8 - Net-zero, climate resilient housing retrofit.
- Flagship Action 9 - Roadmap to an adaptation forum on infrastructure and utilities. Developments should consider flood risk management plans to ensure resiliency against flooding for individual buildings.

Appendix C Analysis of Core Indicators by Intermediate Zone

In this section, we are able to examine the data broken down by Intermediate Zone, which allows targets to be more easily identified within the constraints of data accuracy discussed earlier.

Domestic Energy Efficiency

The Home Analytics tool calculates a weighted energy efficiency score, which takes the frequency of 3 metrics, (low loft insulation thickness, a lack of wall insulation and a lack of double- / triple-glazing) across the building stock in a zone and weights them (by default, each is equally weighted) and then sums the 3 values to get a total energy efficiency score. A high score equates to poor energy efficiency in aggregate across the zone.

Table 18 ranks the top 12 intermediate zones on overall weighted score for energy efficiency. The maximum possible score (i.e. if every home in the zone had no loft or wall insulation and single glazing) is 100 so these scores are not high. It is notable that the spread across the zones is quite wide, with the top two being considerably worse than the average (Figure 63), suggesting that there may be grounds to prioritise interventions in one geographic area over another.

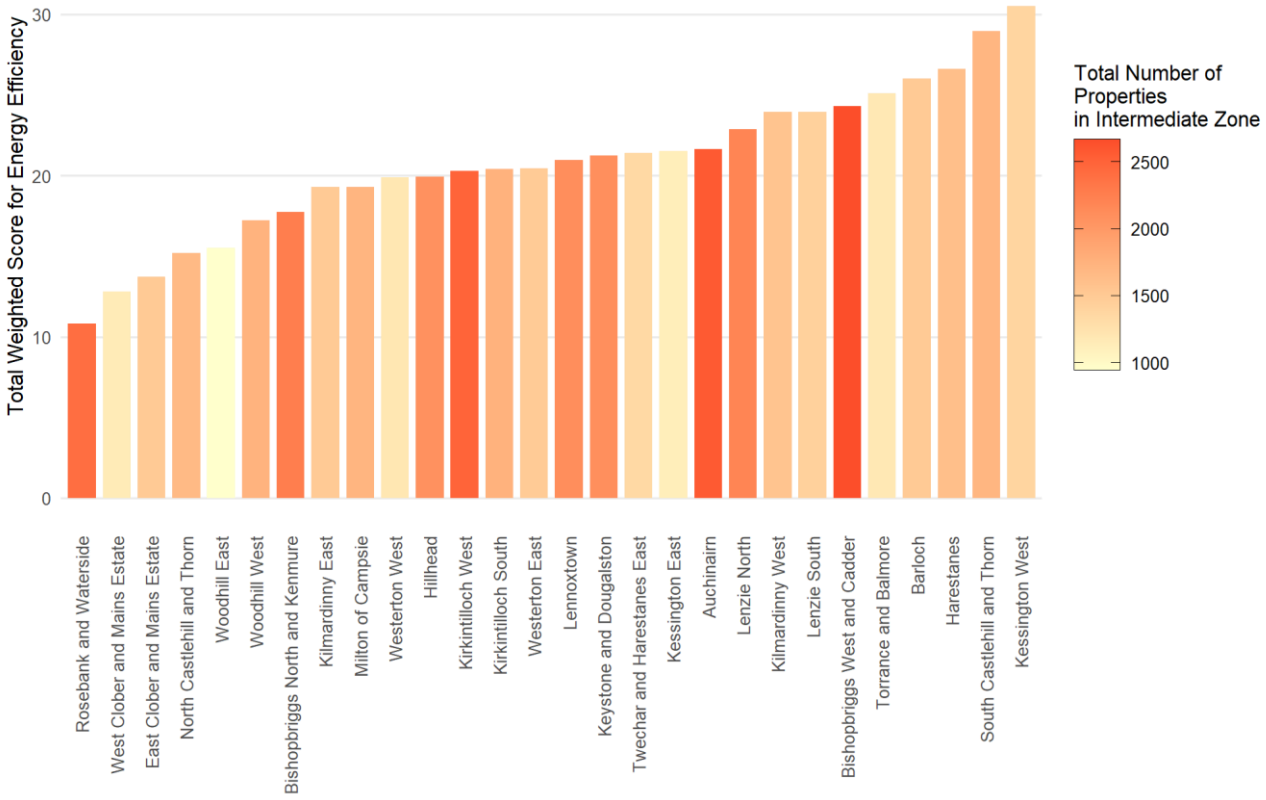
Wall insulation appears to be the most obvious target for improvement with the number of houses requiring an intervention ranging from 35 to 66 % in these 12 zones (compare to 2 to 22 % for loft insulation).

Table 18: Domestic energy efficiency- ranking by highest weighted score

Rank	Zones with highest total weighted score	Total weighted score	Number of potential interventions identified	Number of properties in zone
1	Kessington West	30	1,281	1,394
2	South Castlehill and Thorn	29	1,498	1,717
3	Harestanes	27	1,298	1,614
4	Barloch	26	1,182	1,506
5	Torrance and Balmore	25	899	1,187
6	Bishopbriggs West and Cadder	24	1,945	2,664
7	Lenzie South	24	1,035	1,435
8	Kilmardinny West	24	1,134	1,569
9	Lenzie North	23	1,519	2,202
10	Auchinairn	22	1,680	2,574
11	Kessington East	22	729	1,126
12	Twechar and Harestanes East	21	868	1,344

There are a total of 28 zones.

Figure 63: Weighted Energy Efficiency Scores



Domestic Fuel Poverty

The Home Analytics tool calculates a weighted energy efficiency score, which takes the frequency of 5 metrics, (low loft insulation thickness, a lack of wall insulation, a lack of double- / triple-glazing, the probability of a household being in fuel poverty or extreme poverty) across the building stock in a zone and weights them (by default, the construction parameters are weighted 16.7%, with fuel poverty at 50% and extreme effectively poverty removed by a weighting of zero) and then sums the 5 values to get a total fuel poverty score. A high score equates to extensive fuel poverty as a result of poor energy efficiency across the zone.

It should be emphasised that this measure is intended to highlight homes where a lack of energy efficiency is a driver of fuel poverty and is not an outright measure of fuel poverty.

The ranking of the top 12 zones where energy efficiency is a driver for fuel poverty is shown in Table 19. The default weightings are used and, if specific interventions to tackle fuel poverty are to be prioritised during later stages of LHEES, then it may be appropriate to re-calculate these weighted scores based on the type of intervention planned. The variance between zones is less than for the Total Energy Efficiency Score with a different top two standing out (Figure 64).

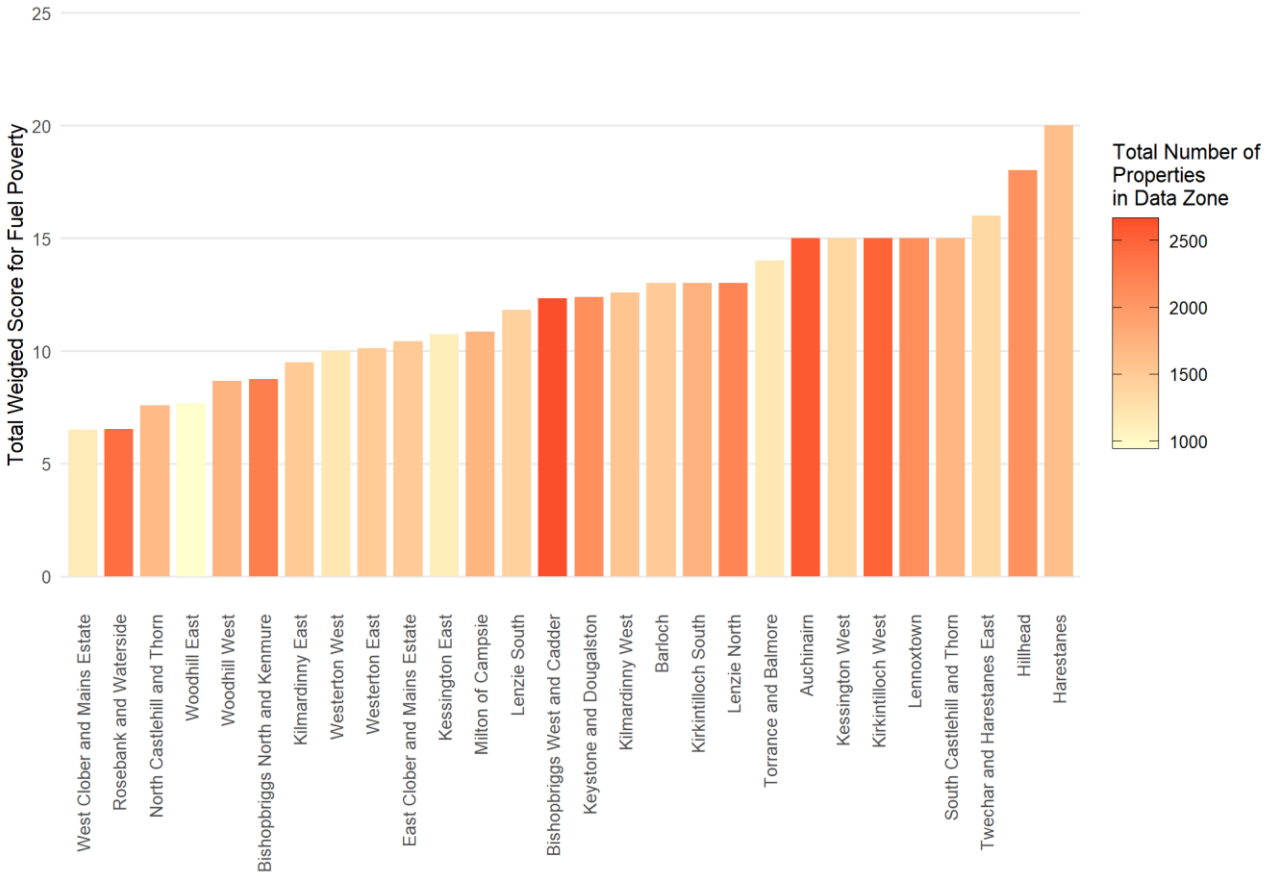
Table 19: Domestic fuel poverty resulting from poor energy efficiency - highest ranked zones (default weightings)

	Zones with highest total weighted score	Total weighted score	Number of properties in zone
1	Harestanes	20	1,614
2	Hillhead	18	2,084
3	Twechar and Harestanes East	16	1,344
4	South Castlehill and Thorn	15	1,717

	Zones with highest total weighted score	Total weighted score	Number of properties in zone
5	Kessington West	15	1,394
6	Kirkintilloch West	15	2,496
7	Lennoxtown	15	2,111
8	Auchinairn	15	2,574
9	Torrance and Balmore	14	1,187
10	Kirkintilloch South	13	1,753
11	Barloch	13	1,506
12	Lenzie North	13	2,202

There are a total of 28 zones.

Figure 64: Weighted scores for energy efficiency as a driver of fuel poverty



Domestic Buildings and the Gas Grid

Being on or off the existing gas grid are considerations within the LHEES process.

Table 20 details the heating systems associated with domestic properties on and off the gas grid. Almost all the on-grid homes are listed in Home Analytics as having boilers and are likely to be able to be heated by a heat networks (if one was made available to them) or heat pumps. Off-grid homes are predominantly electric and switching to heat pumps is more likely to reduce their heating bills but will have a lower long-term effect on carbon emissions.

Table 20: Domestic heating systems on and off the gas grid

Heating System	On grid Count	On grid Percentage	Off grid Count	Off grid Percentage
Communal	120	0.3 %	3	0.1 %
Heat pump	290	0.6 %	118	4.4 %
Boiler	44,119	96.3 %	706	26.1 %
Room heater	330	0.7 %	254	9.4 %
Storage heater	527	1.2 %	1,480	54.8 %
Other or none	331	0.7 %	90	3.3 %

Communal heating systems refer to a heating system which provides heat to multiple properties within the same building.

Appendix D Analysis of Core Indicators by Data Zone

Domestic Energy Efficiency

The Home Analytics tool calculates a weighted energy efficiency score, which takes the frequency of 3 metrics, (low loft insulation thickness, a lack of wall insulation and a lack of double- / triple-glazing) across the building stock in a zone and weights them (by default, each is equally weighted) and then sums the 3 values to get a total energy efficiency score. A high score equates to poor energy efficiency in aggregate across the zone.

Table 21 lists all the zones and is the companion to Figure 29: Histogram of Total Weighted Score for Energy Efficiency by data zone.

Appendix L provides a map and accompanying data table of the data zones in EDC.

Table 21: Energy Efficiency Weighted Scores and Interventions by Data Zones

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
South Castlehill and Thorn - 04	24%	43%	90%	51.8
Westerton East - 01	31%	21%	53%	35.0
Kessington West - 02	16%	16%	72%	34.4
Kilmardinny West - 01	8%	23%	72%	34.3
Auchinairn - 05	15%	39%	43%	32.2
Barloch - 02	13%	12%	70%	31.9
Lenzie North - 07	12%	20%	63%	31.6
Harestanes - 02	5%	14%	75%	31.2
South Castlehill and Thorn - 05	9%	23%	62%	30.8
Kessington West - 01	16%	2%	75%	30.7
Lenzie South - 01	12%	16%	63%	30.3
Kirkintilloch West - 04	15%	13%	63%	30.1
Torrance and Balmore - 02	7%	5%	78%	30.0
Twechar and Harestanes East - 03	7%	2%	80%	29.6
Kessington West - 04	25%	15%	48%	29.5
Bishopbriggs West and Cadder - 08	12%	15%	60%	28.9
Bishopbriggs West and Cadder - 07	12%	8%	67%	28.8
South Castlehill and Thorn - 03	23%	8%	54%	28.5
Torrance and Balmore - 01	15%	16%	55%	28.4
Harestanes - 03	10%	16%	60%	28.4
Kessington East - 01	24%	7%	52%	27.6
Kilmardinny East - 02	18%	12%	53%	27.6
Barloch - 04	12%	8%	63%	27.6
Westerton East - 04	17%	14%	52%	27.4
Kessington West - 03	13%	13%	57%	27.3
Auchinairn - 01	18%	9%	55%	27.1
Bishopbriggs West and Cadder - 05	38%	9%	34%	27.0
Barloch - 03	10%	17%	52%	26.5
Lenzie North - 06	20%	7%	52%	26.5
Hillhead - 04	11%	18%	50%	26.0
Lenzie North - 05	10%	23%	45%	25.9
Bishopbriggs West and Cadder - 03	26%	10%	42%	25.8
Kirkintilloch West - 03	13%	16%	49%	25.7

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
Kilmardinny East - 01	4%	4%	69%	25.2
Lennoxtown - 01	6%	9%	62%	25.1
Auchinairn - 02	9%	26%	41%	25.1
Lennoxtown - 05	12%	28%	35%	24.9
Harestanes - 01	8%	32%	36%	24.8
Westerton West - 02	27%	4%	42%	24.3
Milton of Campsie - 03	3%	13%	57%	24.3
Kirkintilloch South - 03	9%	20%	44%	24.0
Keystone and Dougalston - 04	21%	4%	46%	23.8
Lenzie South - 03	16%	8%	48%	23.8
Kilmardinny West - 03	16%	11%	45%	23.7
Auchinairn - 04	14%	26%	31%	23.5
Keystone and Dougalston - 03	13%	8%	49%	23.3
North Castlehill and Thorn - 02	20%	1%	49%	23.1
West Clober and Mains Estate - 03	3%	12%	54%	23.1
Harestanes - 04	9%	16%	45%	22.9
Bishopbriggs North and Kenmure - 01	20%	8%	41%	22.8
Auchinairn - 03	11%	32%	26%	22.7
Woodhill West - 05	9%	4%	55%	22.6
Bishopbriggs West and Cadder - 06	19%	9%	39%	22.6
Bishopbriggs West and Cadder - 02	27%	5%	35%	22.4
Lenzie South - 04	15%	4%	47%	21.9
Kirkintilloch South - 02	16%	8%	41%	21.7
Kirkintilloch West - 02	15%	8%	43%	21.7
Keystone and Dougalston - 05	17%	5%	42%	21.4
Rosebank and Waterside - 03	12%	25%	28%	21.3
Bishopbriggs North and Kenmure - 02	5%	7%	52%	21.2
Keystone and Dougalston - 01	3%	8%	53%	21.2
Kirkintilloch West - 01	7%	19%	39%	21.2
Westerton East - 05	14%	7%	42%	21.0
Lenzie North - 03	9%	17%	36%	20.9
Milton of Campsie - 04	6%	21%	36%	20.7
Rosebank and Waterside - 02	20%	3%	38%	20.4
Lenzie North - 04	6%	40%	16%	20.4
Twechar and Harestanes East - 04	9%	16%	36%	20.3
Bishopbriggs West and Cadder - 04	19%	5%	36%	20.1
Twechar and Harestanes East - 02	11%	20%	29%	20.1
Westerton West - 01	8%	9%	44%	20.0
North Castlehill and Thorn - 05	14%	5%	40%	19.8
Lennoxtown - 03	5%	30%	25%	19.8
Hillhead - 02	3%	40%	17%	19.7
Kessington East - 04	12%	4%	43%	19.7
Kilmardinny West - 02	6%	7%	47%	19.6
East Clober and Mains Estate - 04	21%	6%	32%	19.6
Kirkintilloch South - 04	7%	17%	35%	19.5

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
Kessington East - 03	19%	5%	34%	19.5
Lennoxtown - 02	4%	30%	25%	19.3
Kessington East - 02	10%	5%	44%	19.3
Keystone and Dougalston - 02	8%	6%	44%	19.1
Kilmardinny West - 04	3%	5%	50%	19.0
Lenzie North - 02	7%	11%	39%	18.9
Hillhead - 03	2%	29%	27%	18.9
Barloch - 01	5%	5%	47%	18.9
Bishopbriggs North and Kenmure - 05	14%	1%	41%	18.8
Torrance and Balmore - 03	8%	10%	39%	18.7
Milton of Campsie - 05	3%	17%	37%	18.7
Kilmardinny East - 04	9%	6%	42%	18.6
South Castlehill and Thorn - 01	13%	4%	37%	18.4
Bishopbriggs North and Kenmure - 06	20%	5%	30%	18.3
Hillhead - 01	4%	9%	42%	18.2
Woodhill East - 02	18%	4%	33%	18.2
Milton of Campsie - 02	7%	15%	32%	18.1
Westerton East - 03	21%	2%	31%	18.1
Lenzie North - 01	3%	3%	49%	18.1
Rosebank and Waterside - 01	16%	3%	36%	18.0
Bishopbriggs North and Kenmure - 04	14%	9%	29%	17.6
Woodhill West - 01	15%	4%	32%	17.1
Lennoxtown - 04	2%	7%	43%	17.0
Lenzie South - 02	9%	4%	38%	16.9
Twechar and Harestanes East - 01	9%	23%	17%	16.5
South Castlehill and Thorn - 02	6%	5%	38%	16.4
Woodhill West - 02	19%	7%	23%	16.2
Bishopbriggs West and Cadder - 01	8%	3%	37%	15.9
Woodhill West - 04	17%	4%	26%	15.7
East Clober and Mains Estate - 03	13%	6%	28%	15.6
Woodhill East - 01	6%	2%	39%	15.6
Westerton West - 03	15%	4%	27%	15.5
Kirkintilloch South - 01	8%	3%	34%	15.3
Bishopbriggs North and Kenmure - 07	18%	5%	22%	15.1
Milton of Campsie - 01	5%	9%	30%	14.7
West Clober and Mains Estate - 04	5%	3%	36%	14.6
Woodhill West - 03	5%	5%	34%	14.4
Hillhead - 05	12%	8%	22%	14.2
Kilmardinny East - 03	11%	4%	24%	13.0
North Castlehill and Thorn - 03	5%	2%	31%	12.9
Woodhill East - 03	5%	4%	29%	12.7
North Castlehill and Thorn - 01	1%	2%	35%	12.7
Bishopbriggs North and Kenmure - 03	10%	3%	20%	11.0
East Clober and Mains Estate - 01	6%	4%	23%	10.9
Kirkintilloch West - 05	5%	3%	22%	10.1

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
North Castlehill and Thorn - 04	3%	1%	25%	9.6

Domestic Fuel Poverty Resulting from Poor Energy Efficiency

The Home Analytics tool calculates a weighted energy efficiency score, which takes the frequency of 5 metrics, (low loft insulation thickness, a lack of wall insulation, a lack of double- / triple-glazing, the probability of a property being in fuel poverty or extreme fuel poverty) across the building stock in a zone and weights them (by default, the construction parameters are weighted 16.7%, with fuel poverty at 50% and extreme fuel poverty effectively removed by a weighting of zero) and then sums the 5 values to get a total weighted fuel poverty score. A high score equates to extensive fuel poverty as a result of poor energy efficiency across the zone.

It should be emphasised that this measure is intended to highlight homes where a lack of energy efficiency is a driver of fuel poverty and is not an outright measure of fuel poverty.

Table 22 lists all the zones and is the companion to Figure 31: Histogram of Total Weighted Score for energy efficiency as a driver of Fuel Poverty by data zone

Appendix L provides a map and accompanying datatable of the data zones in EDC.

Table 22: Fuel Poverty Weighted Scores by Data Zones

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Total Weighted Score
South Castlehill and Thorn - 04	24%	43%	90%	0%	25.6
Harestanes - 02	5%	14%	75%	14%	22.3
Kirkintilloch West - 01	7%	19%	39%	24%	22.3
Auchinairn - 05	15%	39%	43%	10%	21.2
Harestanes - 03	10%	16%	60%	14%	21.1
Hillhead - 03	2%	29%	27%	22%	20.6
Twechar and Harestanes East - 02	11%	20%	29%	20%	20.2
Kirkintilloch West - 03	13%	16%	49%	14%	19.7
Hillhead - 02	3%	40%	17%	19%	19.7
Hillhead - 04	11%	18%	50%	14%	19.7
Harestanes - 04	9%	16%	45%	16%	19.4
Lennoxtown - 02	4%	30%	25%	19%	19.3
Twechar and Harestanes East - 03	7%	2%	80%	9%	18.9
Auchinairn - 04	14%	26%	31%	13%	18.1
Kirkintilloch West - 04	15%	13%	63%	6%	17.8
Lenzie North - 04	6%	40%	16%	14%	17.5
Westerton East - 01	31%	21%	53%	0%	17.4
Kilmardinny West - 01	8%	23%	72%	0%	17.1
Kessington West - 02	16%	16%	72%	0%	16.9
Auchinairn - 03	11%	32%	26%	10%	16.5
Harestanes - 01	8%	32%	36%	8%	16.5
Lennoxtown - 03	5%	30%	25%	13%	16.4
Rosebank and Waterside - 03	12%	25%	28%	11%	16.2
Auchinairn - 02	9%	26%	41%	7%	16.2
Torrance and Balmore - 01	15%	16%	55%	4%	16.2
Kirkintilloch South - 03	9%	20%	44%	8%	16.1
Barloch - 02	13%	12%	70%	0%	15.7
Lenzie North - 07	12%	20%	63%	0%	15.6
Auchinairn - 01	18%	9%	55%	5%	15.6

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Total Weighted Score
Lennoxtown - 05	12%	28%	35%	6%	15.5
Torrance and Balmore - 02	7%	5%	78%	1%	15.3
Kessington West - 01	16%	2%	75%	0%	15.2
South Castlehill and Thorn - 05	9%	23%	62%	0%	15.2
Lenzie South - 01	12%	16%	63%	0%	15.1
Bishopbriggs West and Cadder - 08	12%	15%	60%	2%	15.0
Kirkintilloch South - 04	7%	17%	35%	11%	15.0
Lenzie North - 05	10%	23%	45%	4%	15.0
Hillhead - 05	12%	8%	22%	16%	14.9
Kilmardinny West - 03	16%	11%	45%	6%	14.8
Keystone and Dougalston - 02	8%	6%	44%	11%	14.7
Kessington West - 04	25%	15%	48%	0%	14.6
Bishopbriggs West and Cadder - 07	12%	8%	67%	0%	14.3
South Castlehill and Thorn - 02	6%	5%	38%	12%	14.1
South Castlehill and Thorn - 03	23%	8%	54%	0%	14.0
Bishopbriggs West and Cadder - 05	38%	9%	34%	1%	13.9
Kessington East - 01	24%	7%	52%	0%	13.8
Twechar and Harestanes East - 01	9%	23%	17%	11%	13.8
Kilmardinny East - 02	18%	12%	53%	0%	13.7
Kessington West - 03	13%	13%	57%	0%	13.5
Westerton East - 04	17%	14%	52%	0%	13.5
Barloch - 04	12%	8%	63%	0%	13.5
Milton of Campsie - 04	6%	21%	36%	6%	13.4
Bishopbriggs West and Cadder - 03	26%	10%	42%	1%	13.3
Milton of Campsie - 03	3%	13%	57%	3%	13.2
Barloch - 03	10%	17%	52%	0%	13.2
Lenzie North - 06	20%	7%	52%	0%	13.1
Hillhead - 01	4%	9%	42%	8%	12.9
Lennoxtown - 01	6%	9%	62%	0%	12.5
Twechar and Harestanes East - 04	9%	16%	36%	5%	12.4
Westerton West - 02	27%	4%	42%	1%	12.3
Kilmardinny East - 01	4%	4%	69%	0%	12.3
West Clober and Mains Estate - 03	3%	12%	54%	1%	12.0
Keystone and Dougalston - 01	3%	8%	53%	3%	11.7
Keystone and Dougalston - 04	21%	4%	46%	0%	11.7
Lenzie South - 03	16%	8%	48%	0%	11.7
Lenzie North - 03	9%	17%	36%	3%	11.6
Keystone and Dougalston - 03	13%	8%	49%	0%	11.6
East Clober and Mains Estate - 03	13%	6%	28%	7%	11.4
Bishopbriggs West and Cadder - 02	27%	5%	35%	1%	11.4
Woodhill West - 05	9%	4%	55%	1%	11.3
North Castlehill and Thorn - 02	20%	1%	49%	0%	11.3
Bishopbriggs West and Cadder - 06	19%	9%	39%	0%	11.2
Bishopbriggs North and Kenmure - 01	20%	8%	41%	0%	11.2

Appendix E Off-gas grid and On-gas grid

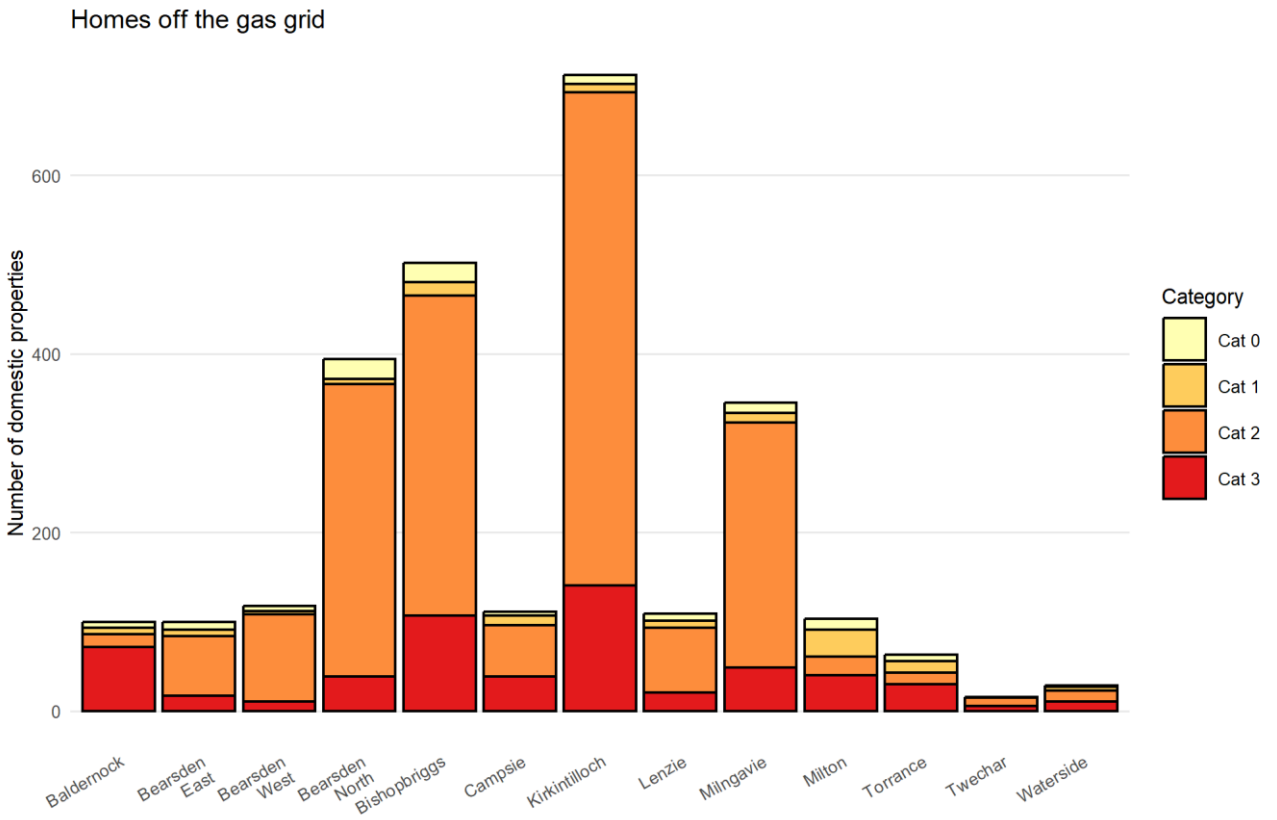
The domestic baseline tool outlines a method of categorising properties based on their suitability for heat pumps. While this report uses an alternative methodology as set out in section 7.7.2.1, this appendix sets out the findings of the methodology set out in the baseline tool, for completeness.

Off-gas grid

The Domestic Baseline Tool categorises individual properties according to how difficult it will be to transition each property to a low-carbon heat source. This is based on several factors including, for example, the existing heating system, listed status and the existing fabric. Category 0 properties are already low carbon, Category 1 properties are ready to make use of a heat pump with minimal changes to the existing building and Category 2 properties could transition with modest changes. Category 3 properties may require such substantial changes that other electrical or biomass heat sources may be more suitable.

Figure 65 shows that the Baseline Tool predicts the majority of off-grid properties to be in Category 1.

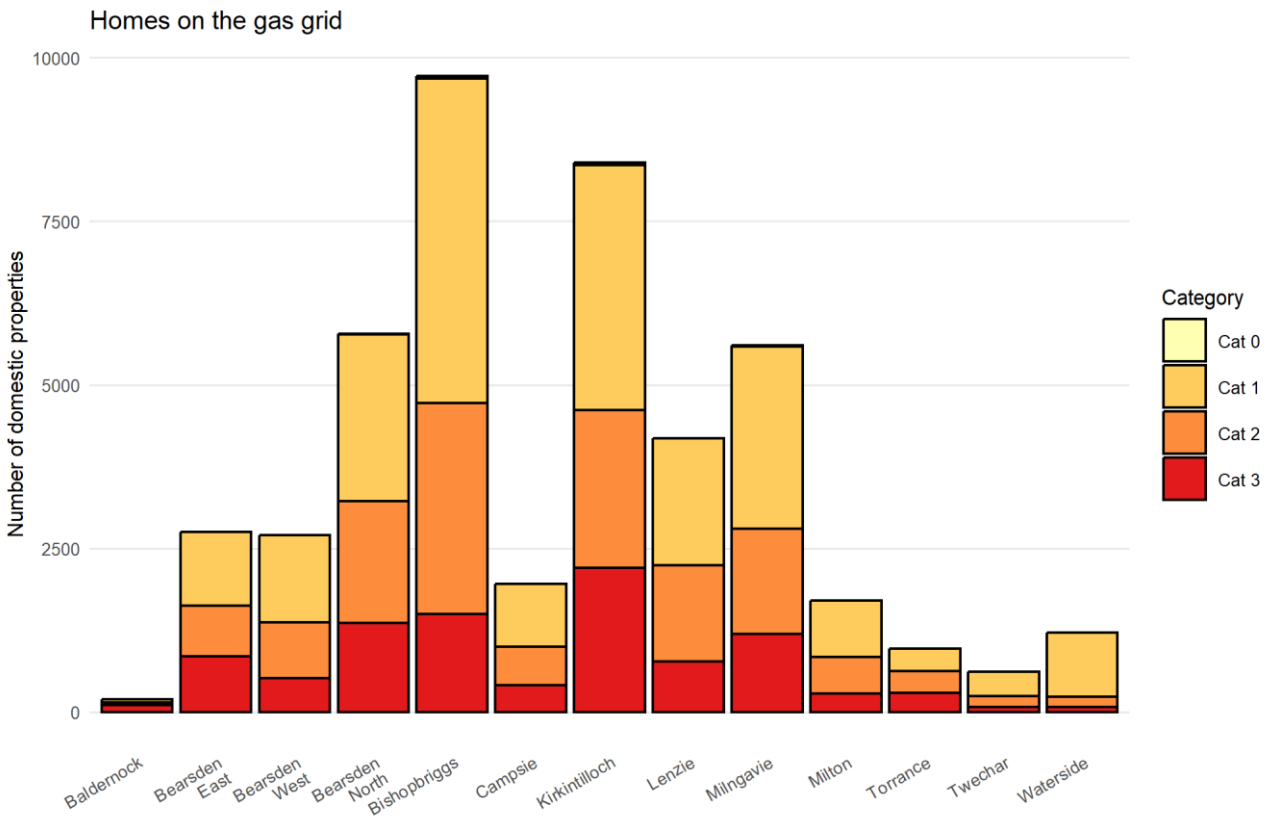
Figure 65: Heat transition categories for off-gas grid domestic properties



On-gas grid

On-gas grid buildings are similarly categorised by the Domestic Baseline Tool although it might be expected that more on-grid properties will find themselves in areas with heat networks and a connection to these rather than heat pumps might be likely. Ignoring heat networks, Figure 66 shows that the Baseline Tool predicts the majority of on-grid properties to be in Category 1

Figure 66: Heat transition categories for on-gas grid domestic properties



Appendix F Linear Heat Density – areas excluded from further analysis

Heat demand was plotted for the Local Authority as described in 7.6.2. Some data points were removed from further analysis as part of data cleaning process. These areas do not have the required demand density are presented below for reference. It can be seen from these maps that even at the most inclusive linear heat density (4,000kWh/m) the circles representing the potential distance from each point where it may be viable to connect to another building, do not overlap in a way whereby there is a continuous area with a significant demand. As such, there is not enough evidence to support further investigation of these areas as potential heat network zones as there is a very low likelihood of district heating being commercially viable while delivering heat at an affordable price.

Figure 67: Milngavie Town Centre

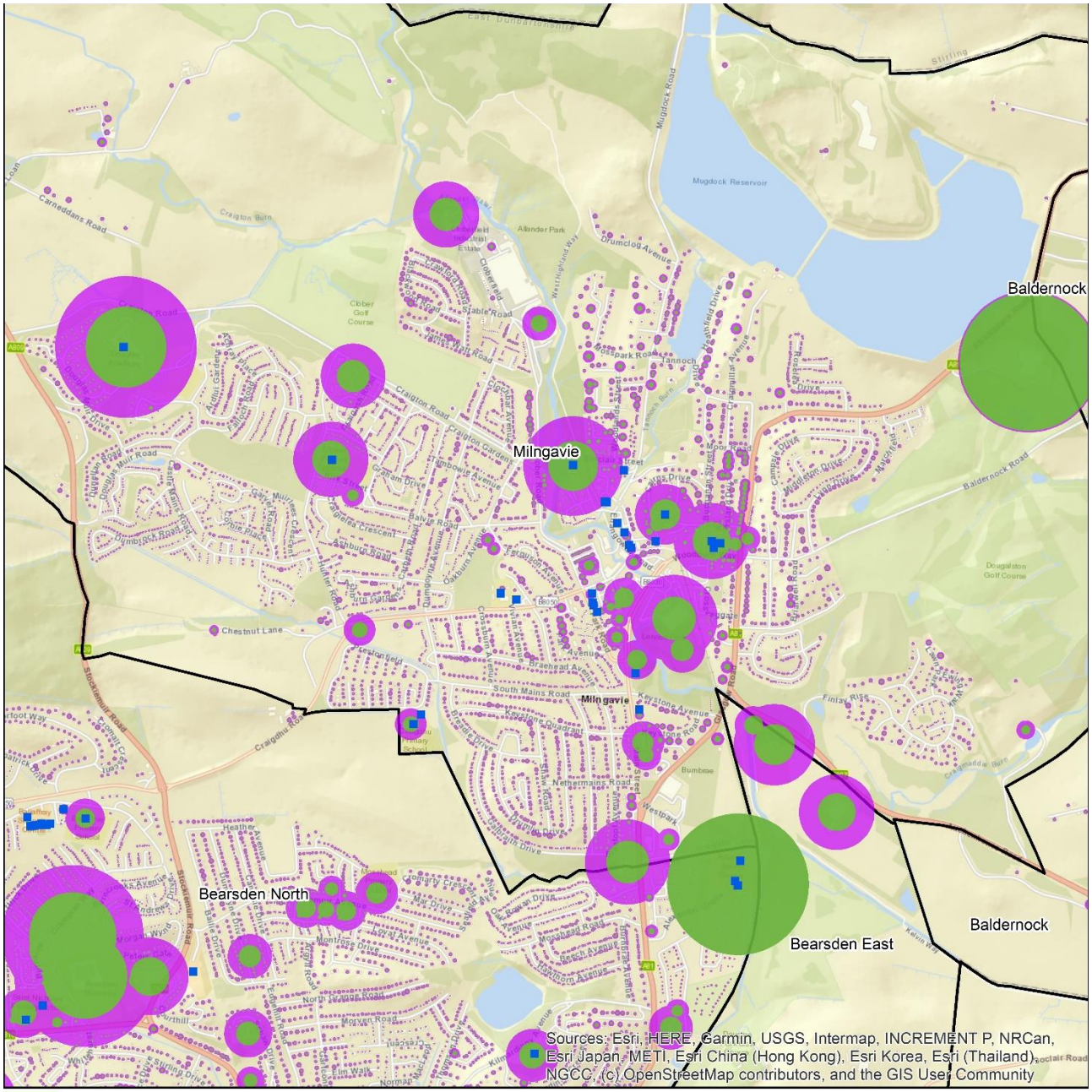
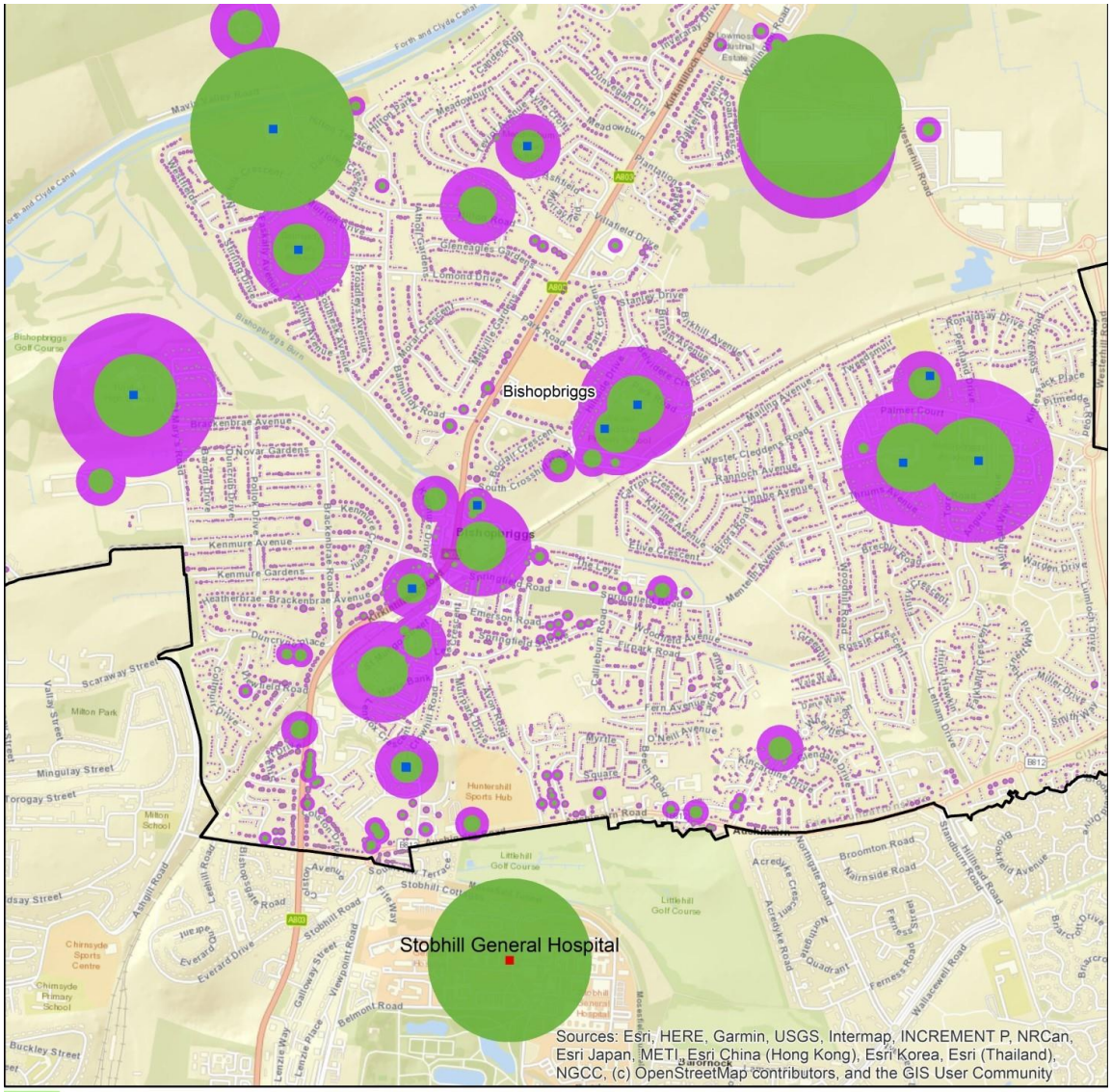


Figure 68: Bishopbriggs Town Centre



Appendix G Heat Pump Suitability Maps

The maps in this appendix highlight, using the methodology described in 7.7.2.1, which homes are ready for heat pumps today (green), will be ready with modest energy efficiency interventions (orange) and may be more difficult, but not necessarily impossible, to convert (red).

Note that these maps have been deliberately produced on a white background, with no roads or other features to allow for a high-level overview of the strategic zones. These are meant to aid in the identification of clusters of properties that are either already heat pump suitable, or need interventions – it is not meant as a building-level identifier for specific properties. Any heat pump implementation needs a detailed study to be conducted by suitably qualified individuals, assessing the existing building and fabric condition.

Note that some of the maps in this section have been adjusted to show areas of population more clearly.

Figure 69: Heat pump suitability map- Baldernock

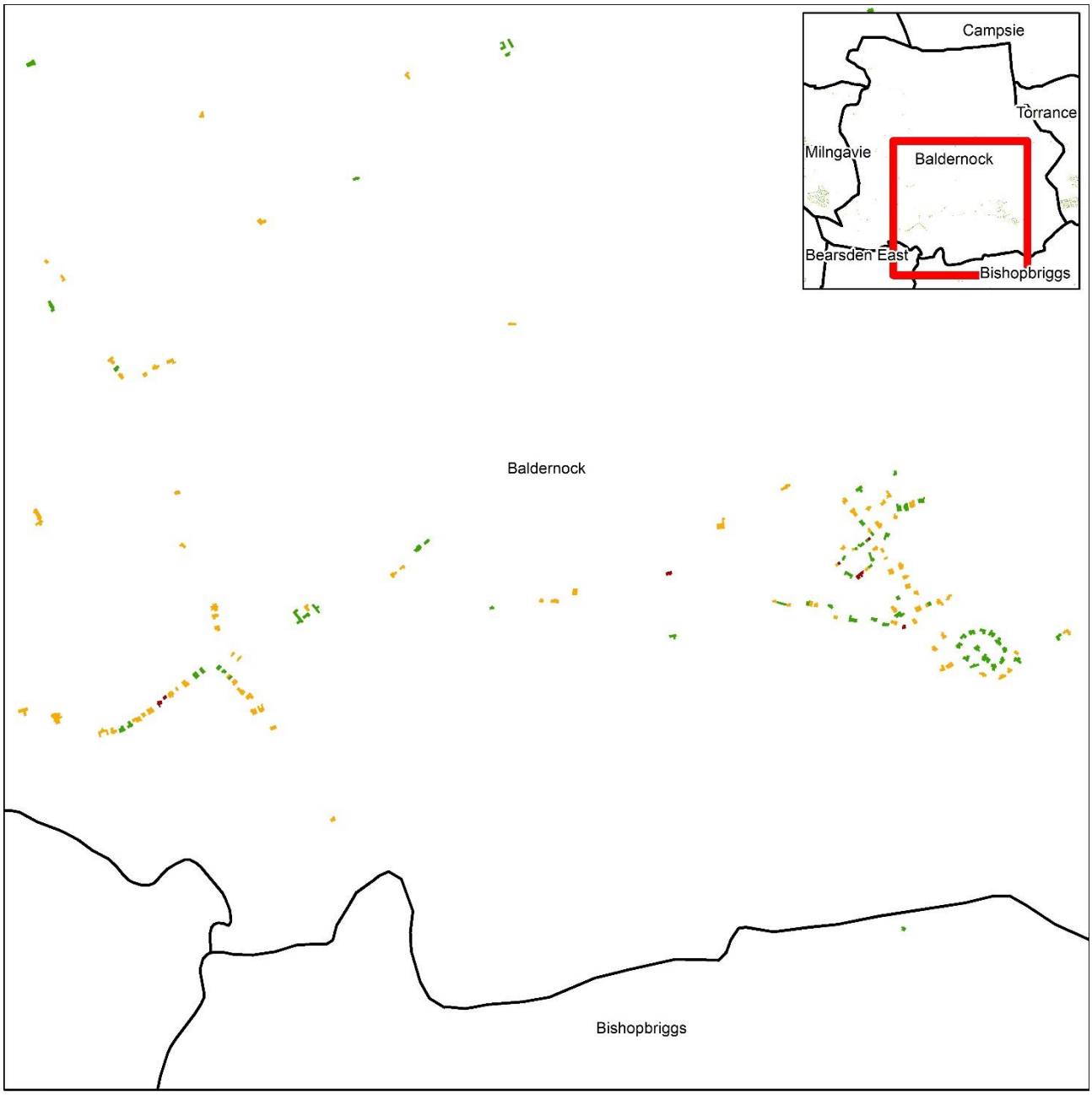
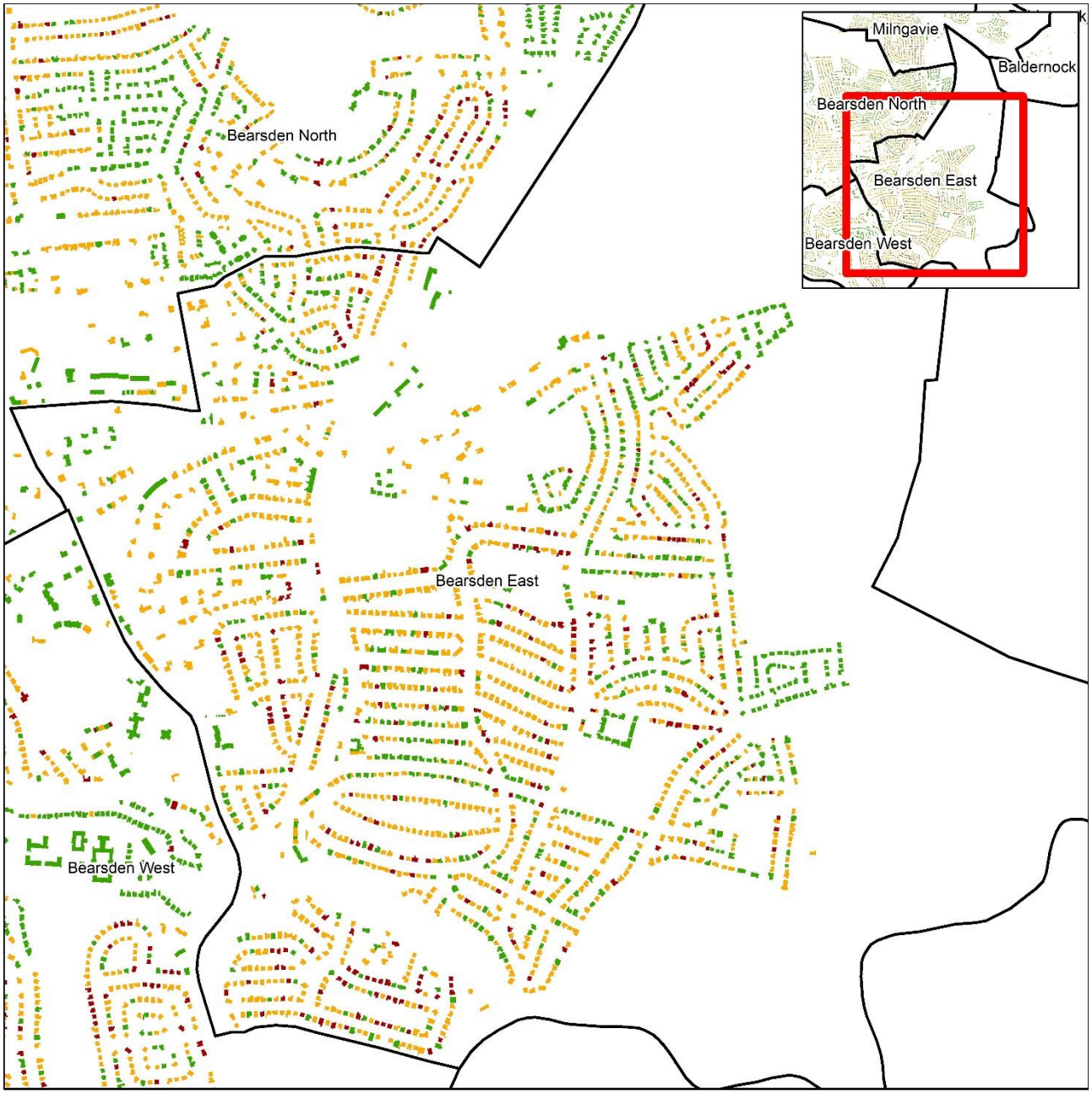


Figure 70: Heat pump suitability map - Bearsden East



Heat pump suitability

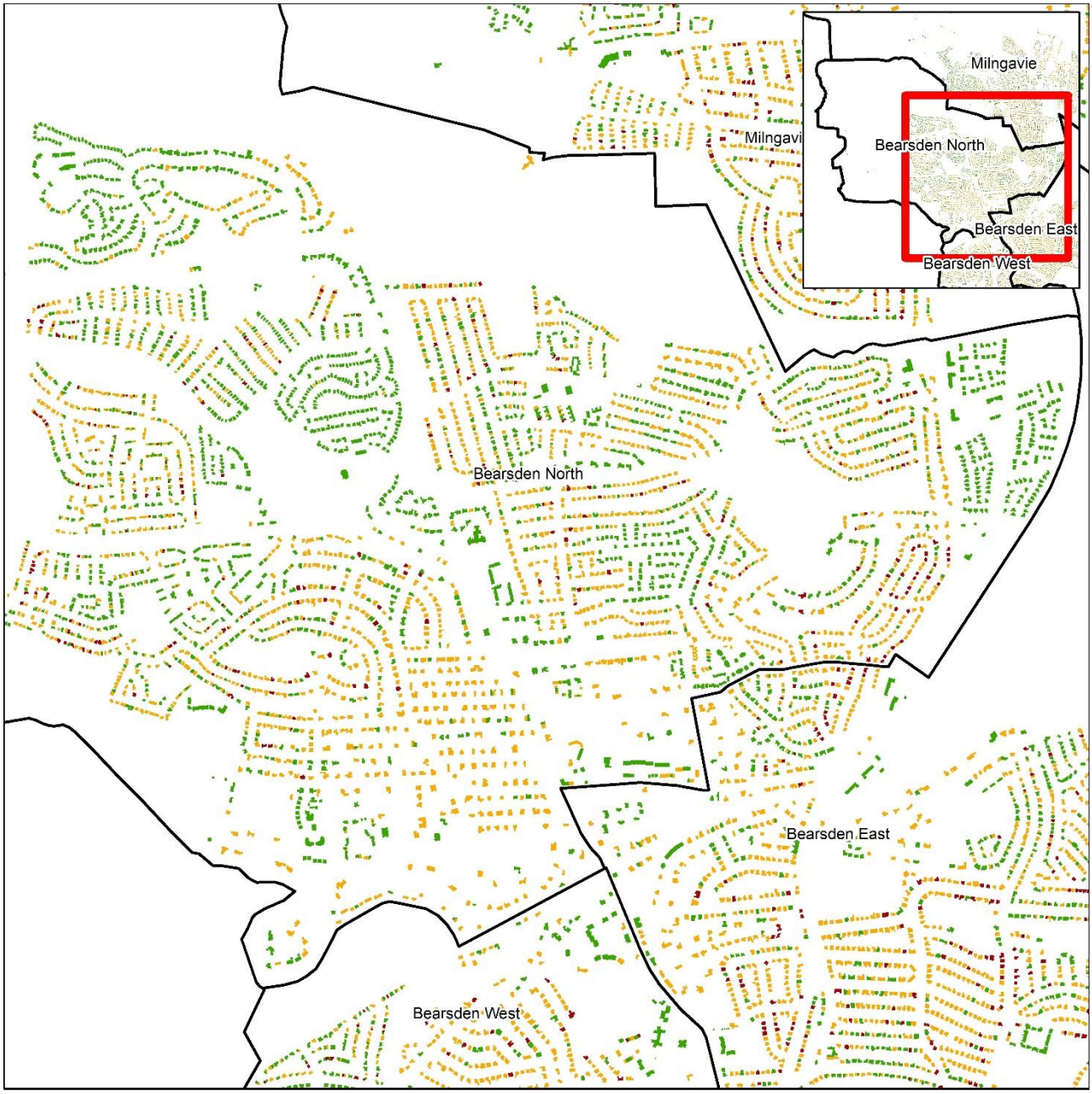
Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)

Figure 71: Heat pump suitability map - Bearsden West

Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)

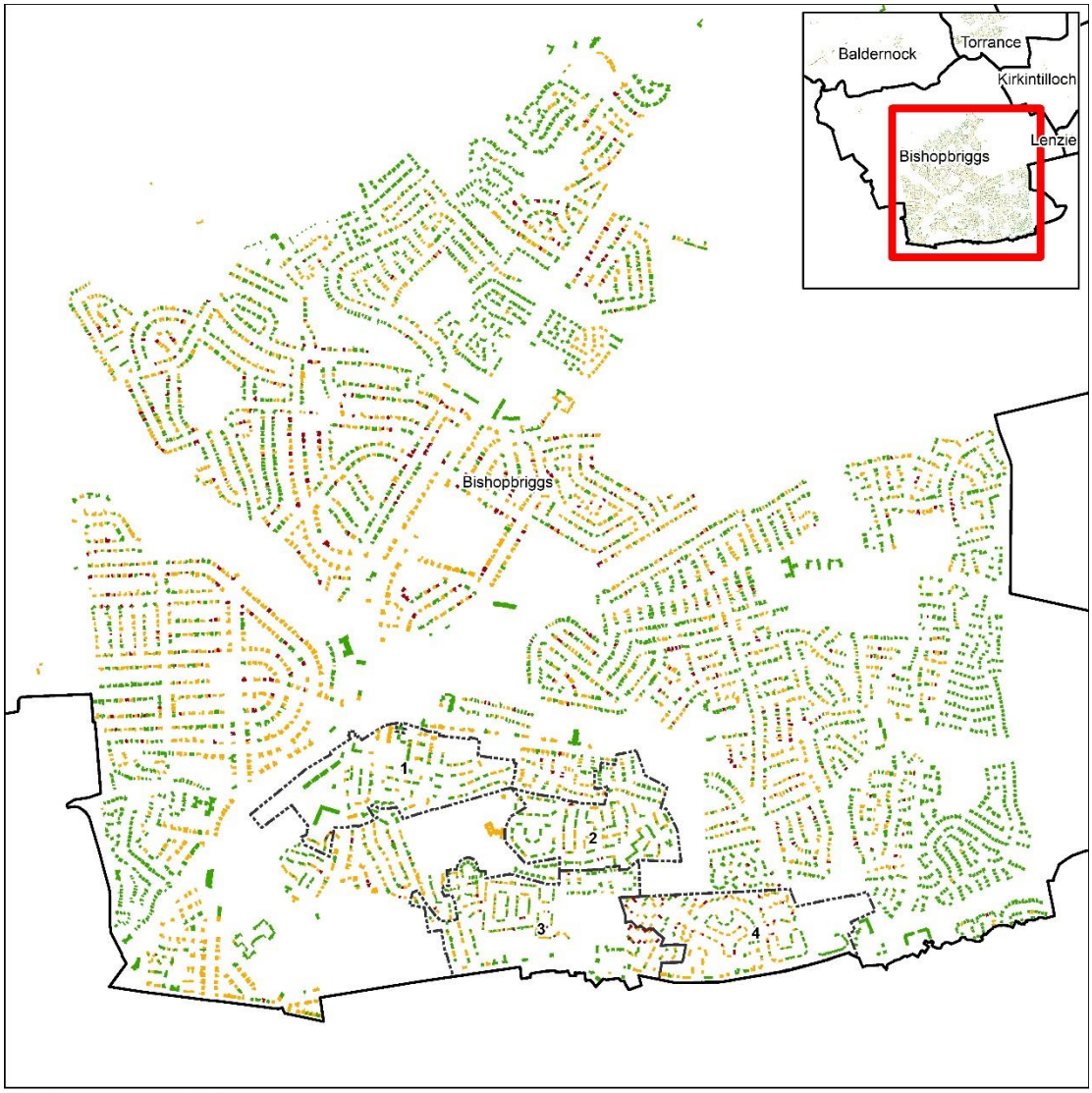
Figure 72: Heat pump suitability map - Bearsden North



Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)

Figure 73: Heat pump suitability map - Bishopbriggs



Heat pump suitability

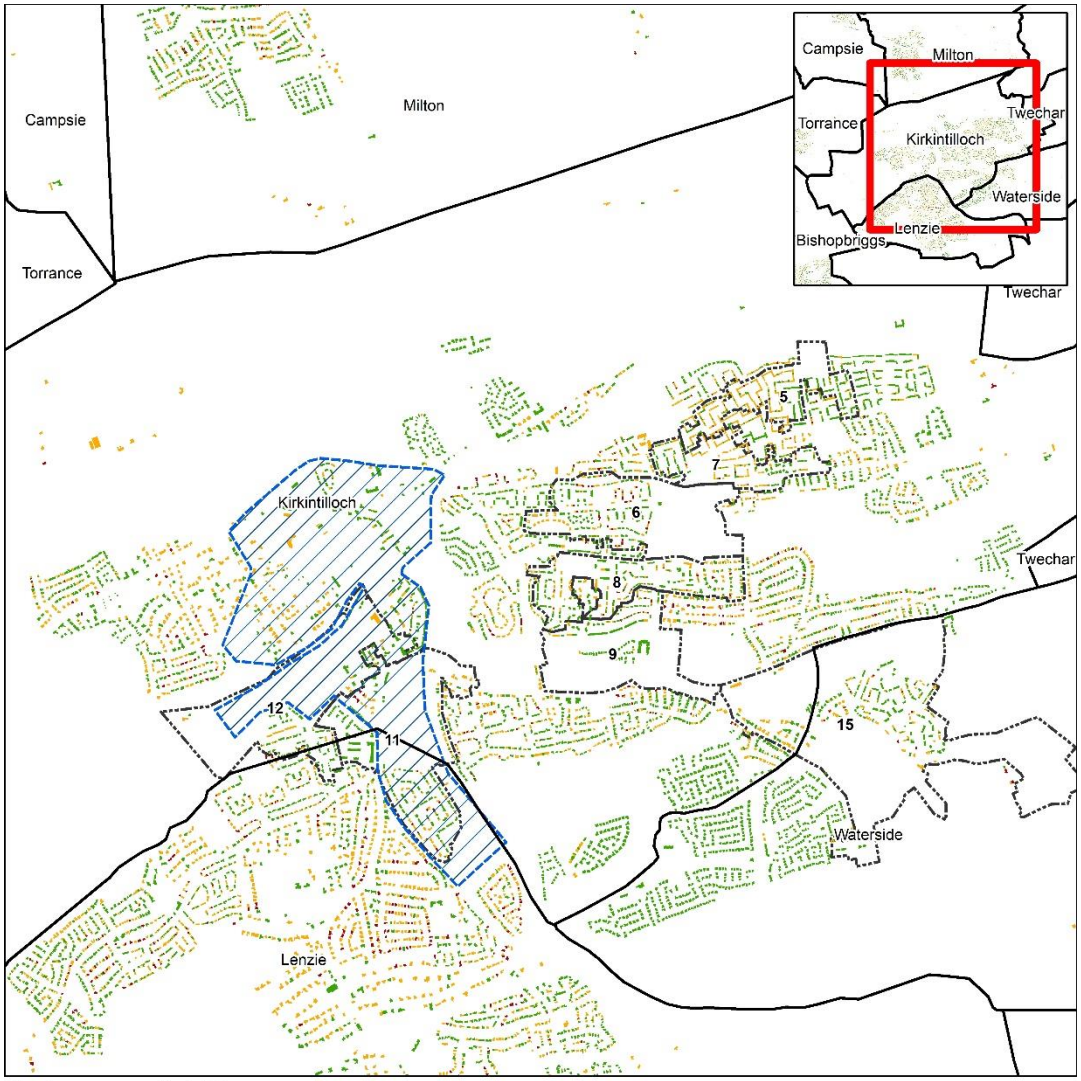
Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)
Priority delivery area	

Figure 74: Heat pump suitability map - Campsie

Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)
Priority delivery area	

Figure 75: Heat pump suitability map - Kirkintilloch



Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)
Potential heat network area	
Priority delivery area	

Figure 76: Heat pump suitability map - Lenzie

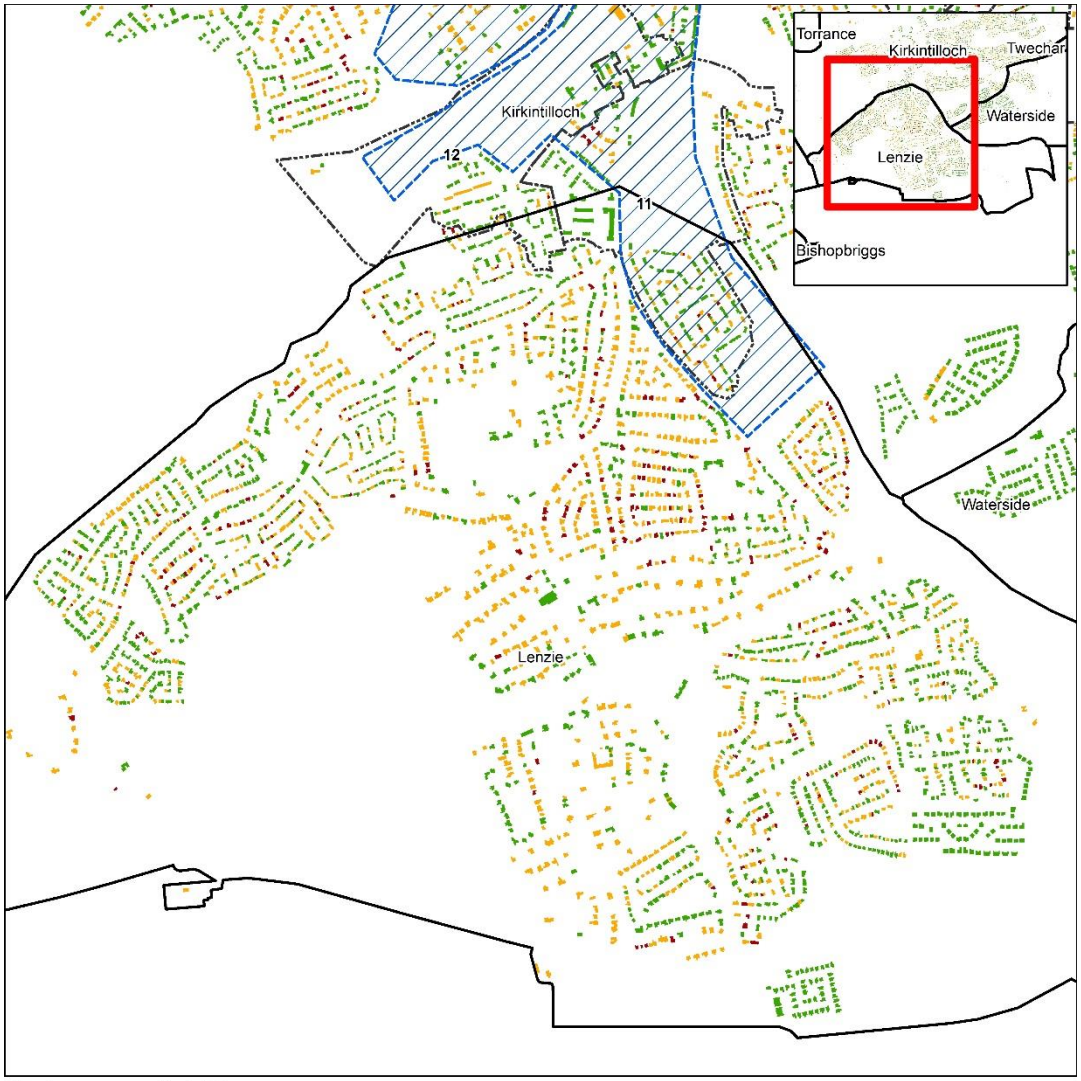
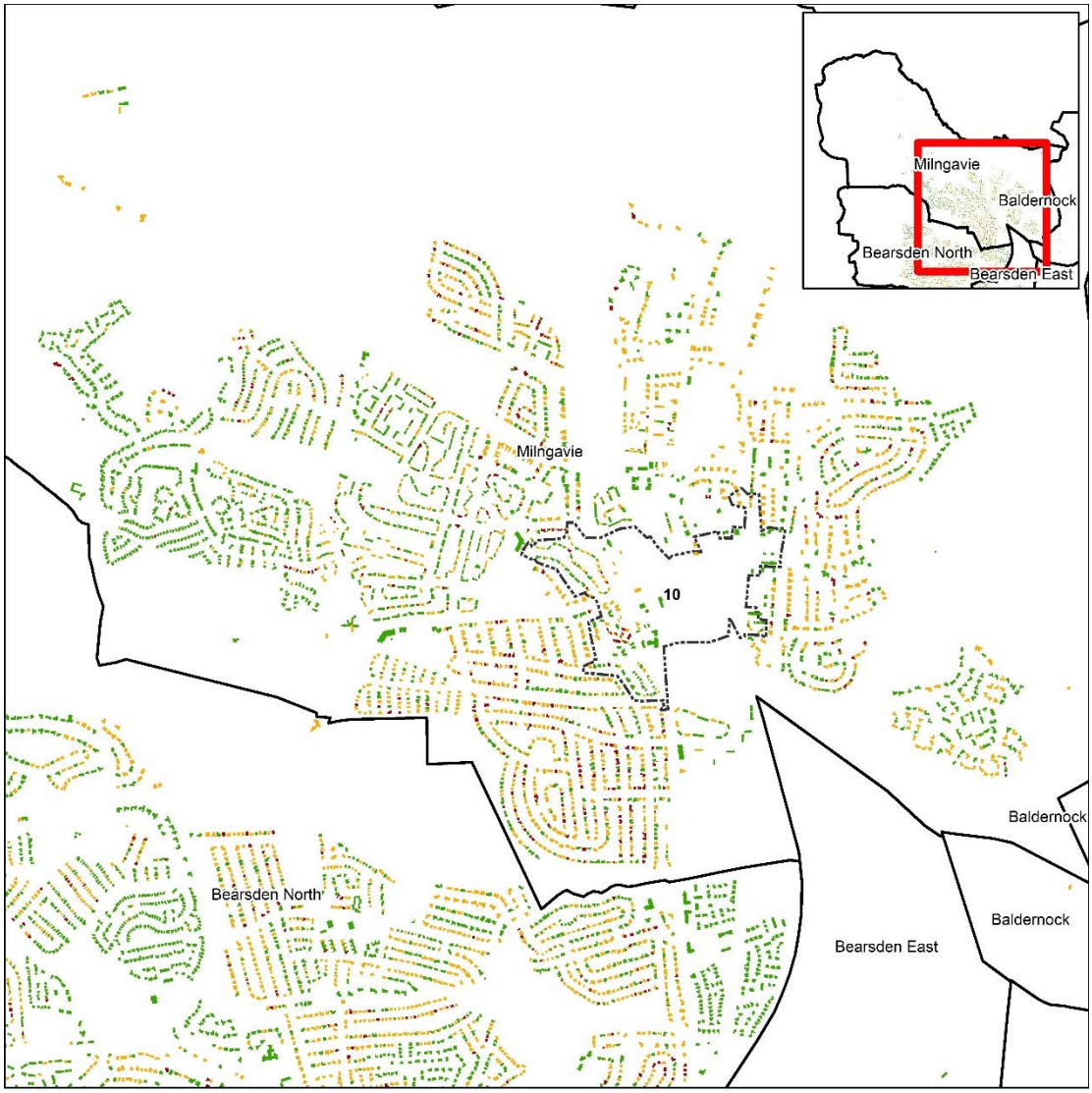


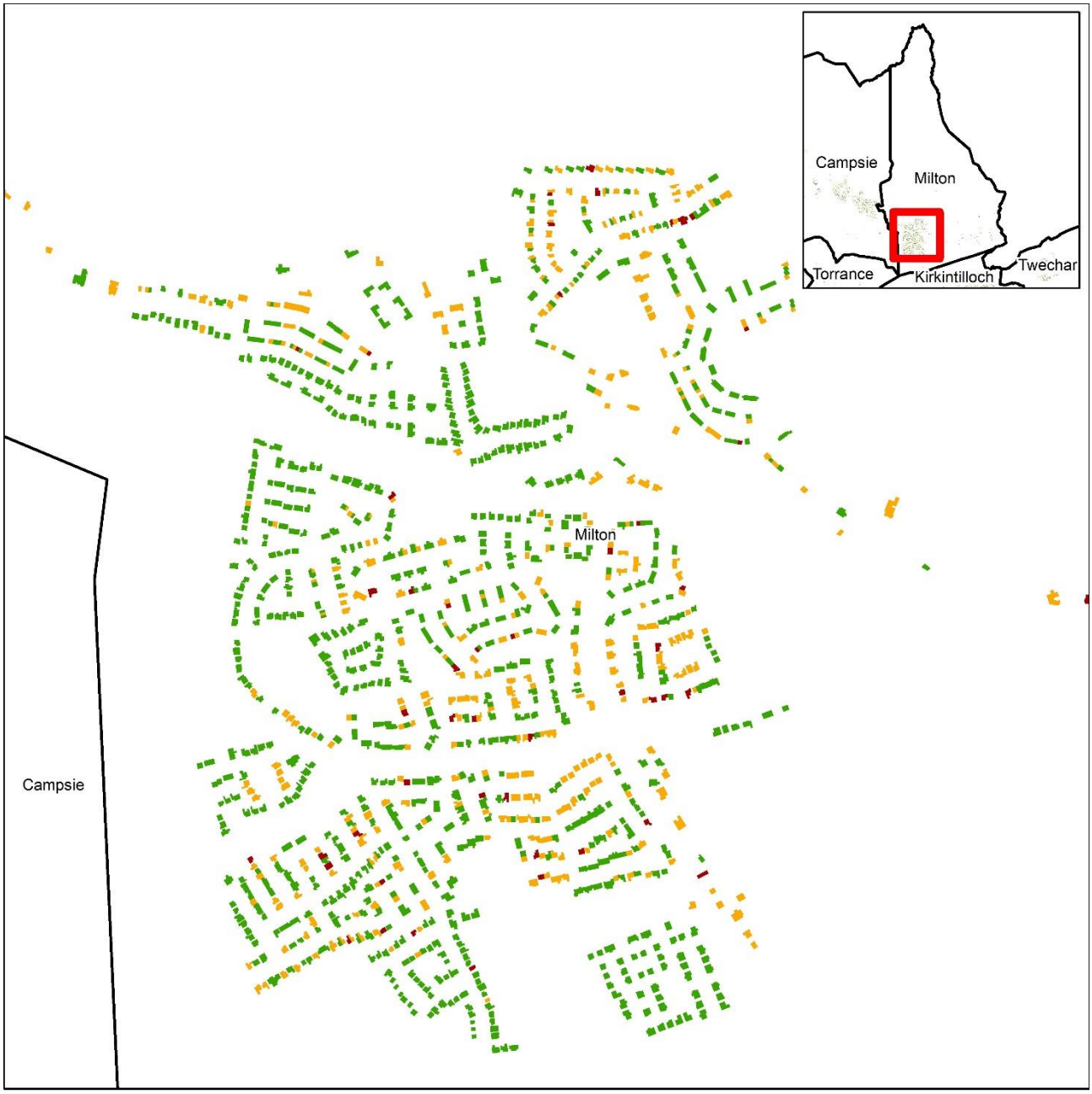
Figure 77: Heat pump suitability map - Milngavie



Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)
Priority delivery area	

Figure 78: Heat pump suitability map - Milton



Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)

Figure 79: Heat pump suitability map - Torrance

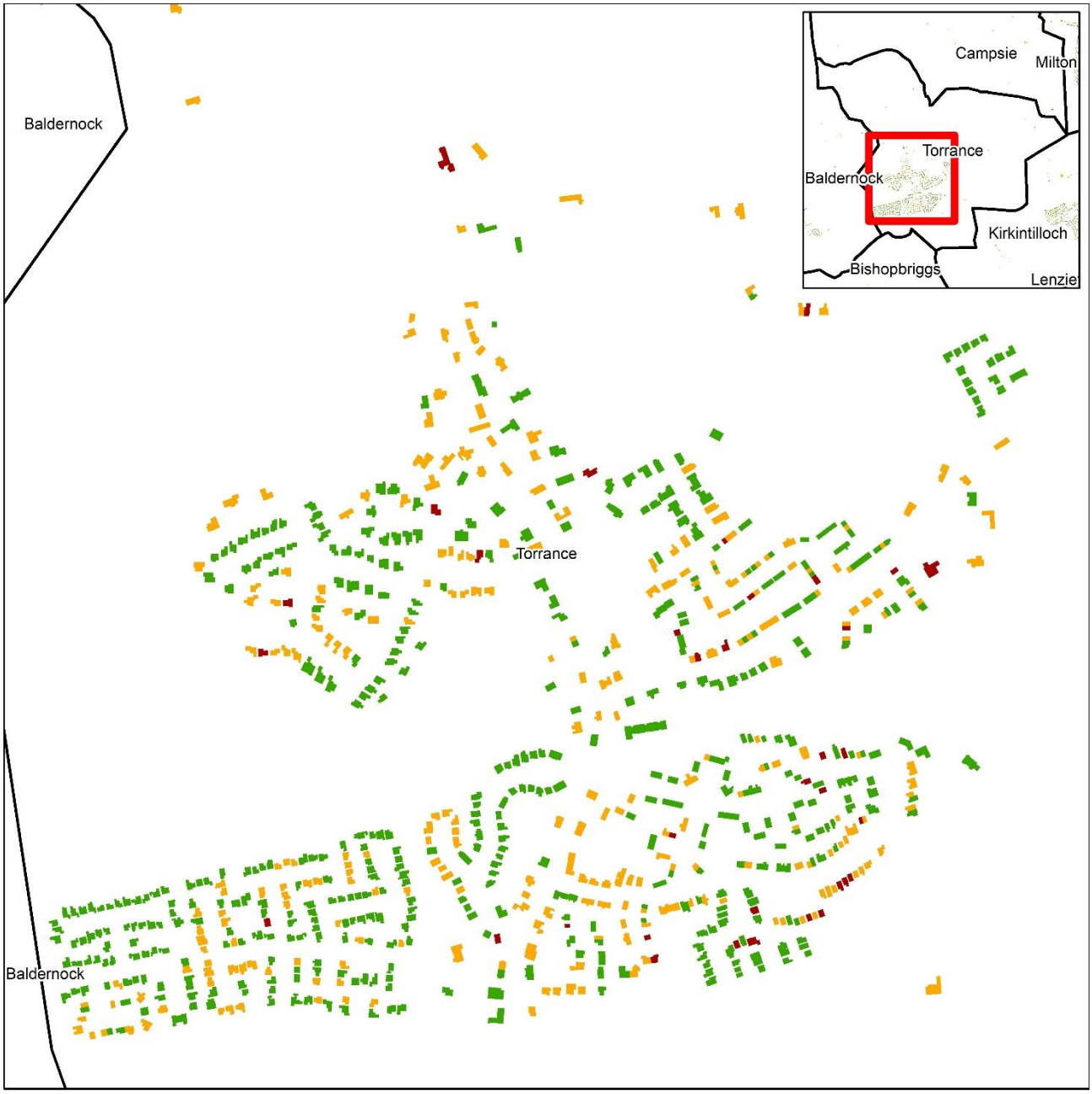
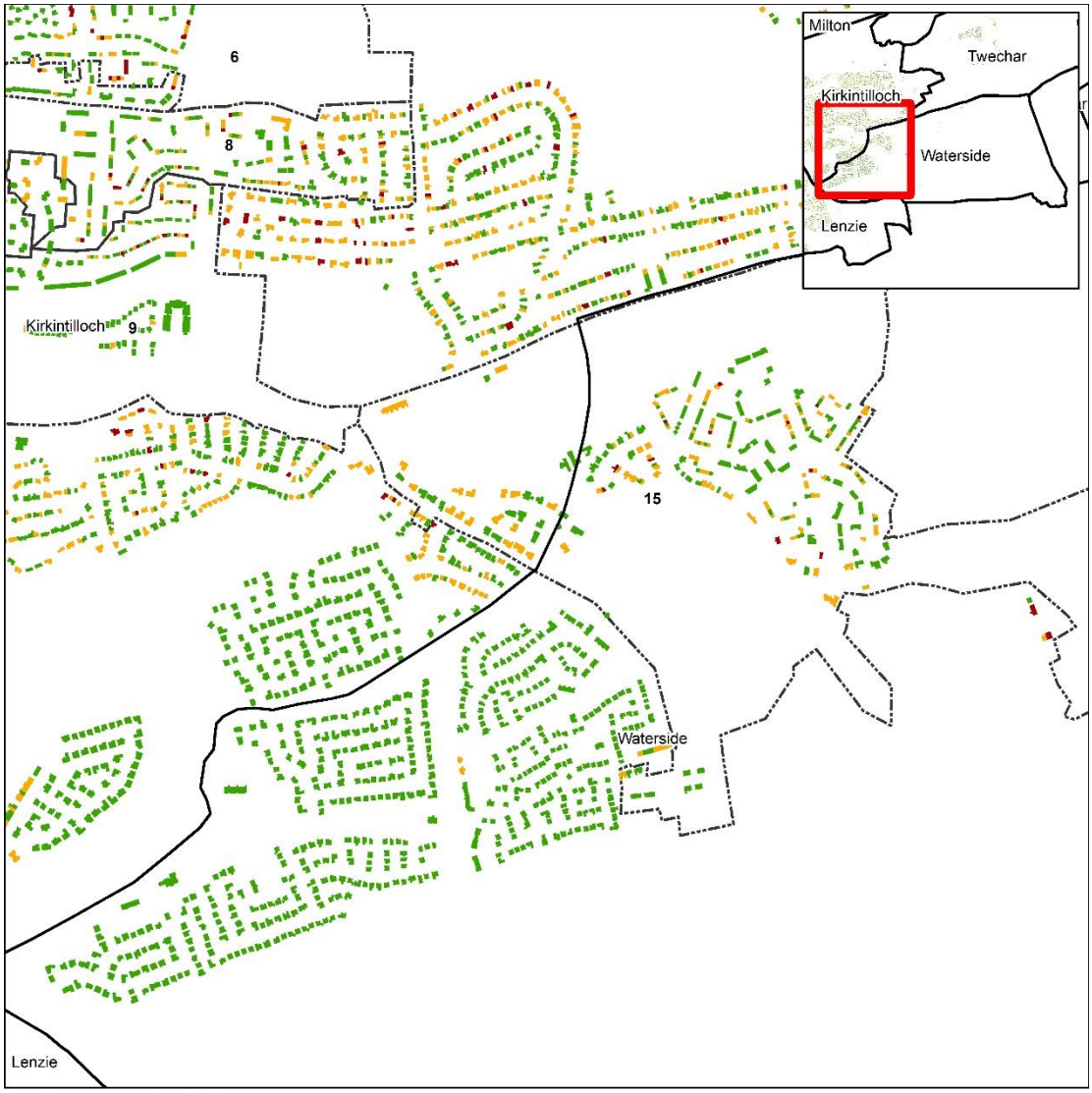


Figure 80: Heat pump suitability map - Twechar

Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)

Figure 81: Heat pump suitability map - Waterside



Heat pump suitability

Likely to be suitable for heat pumps	(heat demand < 160 kWh/m2/year)
Likely to be suitable for heat pumps with insulation	(heat demand < 160 kWh/m2/year after EE measures)
Harder to treat with heat pumps	(heat demand > 160 kWh/m2/year after EE measures)
Priority delivery area	

Appendix H Engagement and Consultation

At the time of writing, the following external organisations and internal teams have been involved in various stakeholder meetings

NHS Greater Glasgow

A stakeholder engagement was carried out during the development of LHEES stages 3-7 in May 2024. The discussions allowed to establish the collaboration requirements in line with East Dunbartonshire's LHEES and confirm whether any major changes to NHS properties in EDC area are to be expected in the near or long-term future. The Council and consultant were also able to confirm that the energy consumption estimates used for the linear heat density analysis were accurate. Subsequent correspondence allowed recent gas consumption data from the Milngavie clinic and Stobhill Hospital Campus to inform the analysis of cross-border collaboration opportunities between East Dunbartonshire and Glasgow.

Scottish Power Energy Networks (SPEN)

SPEN was engaged to discuss any Distribution Network Operator (DNO) and grid capacity constraints that may influence the strategy and delivery plan. The initial meeting was held in November 2023 and was followed up by a discussion in May 2024 and a demonstration of their LANIT NAVI tool in June 2024, to consider its applicability to determine strategic zones and delivery areas. SPEN advised that several areas may be subject to limitations in infrastructure to meet the increasing demand from heat pumps and electric vehicles, which may require prioritised interventions. More specifically, they described looped electricity services across East Dunbartonshire where there is a single link to the electricity grid for multiple properties. There is more limited capacity in these looped services so SPEN are in the process of replacing looped networks but they noted that there are challenges to this. An example that was discussed included the significant amount of looped services in Twechar which means that electric vehicle charging and heat pump installations will be more limited for buildings connected to looped services until the network is unlooped. EDC aims to continue collaborations with SPEN on this in line with the LHEES delivery plan.

Highland Spring

Highland Spring has a major commercial footprint in the area with manufacturing operations in Lennoxtown and has been a key local employer in the area for over 14 years. EDC joined a site visit in November 2023 to understand the scope of work undertaken on site, and a meeting was held with the company's sustainability team in June 2024, following further development of the LHEES, to discuss possible decarbonisation targets, heat demand values and opportunity for collaboration across wider sustainability work.

Scottish Prison Service

The HMP Low Moss Site in Bishopbriggs is located adjacent to the proposed Westerhill Development and a retail centre, and was therefore identified as a key stakeholder in case there were any proposed expansions or refurbishments that would affect the heat demand of the site. During the meeting in June 2024, EDC and their consultant for the LHEES were able to confirm the heat demand values that were used for the analysis and the Prison Services are included as a key stakeholder for future collaborations.

The LHEES Working Group and Internal Engagements

EDC's internal engagements (during LHEES stages 3-8) focused on housing investments, assets, regeneration and city deal teams to establish a collaborative approach for developing the LHEES and delivery actions in line with ongoing work and delivery targets, resource availability and alignment with other policies/ strategies. The data gathered were used to assess the analysis outputs against the deliverability of specific actions, which are reflected in the delivery plan. A summary of points raised during these discussions are listed below:

- EDC takes a "fabric first" approach for energy efficiency measures/ retrofits, which links closely with LHEES considerations 4 and 5. Cavity Wall Insulations (CWI) are currently prioritised for EDC's own housing stock due to higher levels of impact on improving the thermal performance of buildings. Upgrading single glazing to double glazing has been identified to be the most challenging, due to limited interest and opportunities to take this up typically occurring at the change of tenancies. Loft insulations are identified to be the cheapest and easiest.
- Poorly insulated buildings and lack of data on building conditions are challenges for determining the level of intervention needed for providing low carbon heating systems. Therefore, EDC has planned to conduct stock condition surveys (aiming to survey around 25% of the housing stock to identify

properties in critical conditions within the first year) and instal environmental sensors. This will provide data on a variety of factors including the thermal performance of the building fabric, as a first step, based on which the council could determine the scale of the challenge to undertake retrofits and gather resources needed to address it.

- Upcoming boiler replacement periods may present an opportunity for the adoption of low carbon heating solutions such as heat pumps. However, there remain challenges in terms of up-front costs, running costs and uptake of heat pumps may need work around raising awareness and behavioural change, especially for decarbonising and improving energy efficiency in private sector domestic properties.
- There are challenges in securing the necessary long-term funding for providing place-based decarbonisation solutions and collaboration with the private sector and housing associations would be necessary to drive area-wide actions.
- Decarbonising the fleet is also a priority for EDC, which may create opportunities for collaboration with private sector stakeholders for sharing infrastructure, and re-evaluation of the grid capacity. Furthermore, designation of heat network zones has implications for the next local development plan (LDP), with opportunities to promote sustainable developments and for attracting the necessary private sector investments, which altogether have significant implications for the delivery of the LHEES. However, since this will create additional demand on the electricity grid, it will have to align with major heat decarbonisation projects.

Appendix I Default indicators and calculation weightings

The LHEES methodology sets out a core set of default indicators and analysis weightings which have been used in this report. For each of the six given considerations defined in Table 2 the purpose of an Indicator is:

1) To act as a key information field to help characterise the Local Authority using the Baseline tool as part of LHEES stage 3 (authority-wide and at a strategic level).
2) To act as a key information field to support strategic zoning and generation of initial delivery areas (as part of LHEES stages 3 and 4).
3) If suitable, to act as a key information field to measure progress against targets over the duration of the LHEES – set out in LHEES stage 8, LHEES Delivery Plan. For some Considerations, one Target and Indicator may be sufficient, but for others a range of Indicators may be appropriate to contextualise and characterise performance against a Target and/or progress towards a Consideration.

There is flexibility to update and augment these indicators to support local needs or for more focused analysis linked to specific actions and project identification within the future Delivery Plan. In reviewing the policies identified, there was no reason found to amend the indicators used in the National Assessment and as such, this study uses these default indicators and weighting values.

Theme	Indicator	Criteria	Weighting	Description	Data source. if known
Building energy efficiency	Loft insulation	<100mm (prediction) (Yes)	33.33%	Binary identifier. Used to identify properties with a low energy efficiency, properties with no or minimal loft insulation.	Home Analytics
	Single glazed windows	Binary (Yes)	33.33%	Binary identifier. Used to identify properties with a low energy efficiency, properties with single glazed windows.	Home Analytics
	Wall insulation prediction (all construction types)	Binary (Uninsulated)	33.33%	Binary identifier. Used to identify properties with a low energy efficiency, properties with uninsulated walls.	Home Analytics
Energy efficiency as a driver of fuel poverty	Probability of fuel poverty	% likelihood	50%	50% is default but set to 0% if extreme fuel poverty is to be analysed.	Home Analytics
	Probability of extreme fuel poverty	% likelihood	0%	0% is a default Weighting applied. User can adjust balance by selecting 0% or 50% to switch analysis focus between fuel poverty or extreme fuel poverty.	Home Analytics
	Loft insulation	<100mm (prediction) (Yes)	16.67%	Poor energy efficiency Indicators sum to 50% of overall Weighting, each have an equal Weighting.	Home Analytics
	Single glazed windows	Binary (Yes)	16.67%		Home Analytics

Theme	Indicator	Criteria	Weighting	Description	Data source. if known
	Wall insulation prediction (all construction types)	Binary (Uninsulated)	16.67%		Home Analytics
Additional example Indicators that could be used to support Delivery Level Area identification as part of LHEES stage 4 and Delivery Plan	Tenure type	User defined		Four types: housing association, owner/ occupier, private rented, Local Authority. User can filter by interest.	Home Analytics
	Building age	User defined		Defined in six age brackets. User can filter by interest.	Home Analytics
	Non-traditional build design type	Solid wall (binary)		User can filter by interest.	Home Analytics
	EPC Rating	E, F or G		User can filter by interest.	Home Analytics

Appendix J Intervention Details

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
1	1) Off-gas grid buildings	All		n/a		2,702	
2	2) On-gas grid buildings	All		Gas		45.799	
3	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Wall insulation	n/a	3.1 Investigate if wall insulation can be added 3.2 Add wall insulation where feasible	825	All walls, uninsulated
4	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Windows	n/a	4.1 Survey properties with single glazing 4.2 Upgrade windows to double glazing	809	
5	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Loft insulation	n/a	5.1 Survey properties with missing data. 5.2 Upgrade all insulation to over 330 mm glass wool (or equivalent)	130	There should be an economy of scale, number listed for properties with 0-99mm
6	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Heat pump installation	Electricity	6.1 Survey properties for wet heating system installation requirements. 6.2 Install ASHP	167	Cost for retrofitting will be variable. There should be an economy of scale.
7	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Heat pump installation	Oil / LPG	7.1 Install ASHP	3	
8	2) On-gas grid buildings 4) Poor building energy efficiency	Local Authority	Heat pump installation	Gas	8.1 install ASHP	2,826	Includes 2 x properties with

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
	5) Poor building energy efficiency as a driver of fuel poverty				8.2 install electric cooker		"no fuel" listed as main fuel, assumed erroneous
9	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Heat pump installation	Solid/ biomass	9.1 Survey solid fuelled buildings for requirement for wet heating system 9.2 Install ASHP	7	
10	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Wall insulation	All	EDC Housing Association Working Group	433	
11	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Windows	All	EDC Housing Association Working Group	264	
12	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Loft insulation	All	EDC Housing Association Working Group	34	Number listed for properties with 0-99mm
13	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Electricity	EDC Housing Association Working Group	65	
14	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Oil/ LPG	EDC Housing Association Working Group	1	
15	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Gas	EDC Housing Association Working Group	1,209	
16	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Solid / biomass	EDC Housing Association Working Group for solid fuelled buildings	4	

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
17	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Wall insulation	All	EDC Owner Occupier Working Group	16,741	
18	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Windows	All	EDC Owner Occupier Working Group	3,924	
19	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Loft insulation	All	EDC Owner Occupier Working Group	4,663	
20	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Electricity	EDC Owner Occupier Working Group	1,754	
21	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Oil / LPG	EDC Owner Occupier Working Group	376	
22	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Gas	EDC Owner Occupier Working Group	35,397	Includes 38 properties listed as “No fuel”
23	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Solid / biomass	EDC Owner Occupier Working Group for solid fuelled buildings	73	
24	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Wall insulation	All	EDC Privately Rented Working Group	1,668	
25	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Windows	All	EDC Privately Rented Working Group	403	
26	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Loft insulation	All	EDC Privately Rented Working Group	404	

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
27	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Electricity	EDC Privately Rented Working Group	181	
28	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Oil / LPG	EDC Privately Rented Working Group	38	
29	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Gas	EDC Privately Rented Working Group	2,632	Includes 7 properties listed as “No fuel”
30	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Solid / biomass	EDC Privately Rented Working Group for solid fuelled buildings	14	
31	6) Mixed-Tenure / Mixed-Use	All	-	All		5,390	For info
32	6) Conservation Area	All	-	All		3,076	For info
33	6) National Park	All	-	All		0	For info
34	6) Historic Building (listed)	All	-	All		250	For info
35	3) Heat Networks	All	-	All	Heat network feasibility studies	2,002	For info

Appendix K Intervention Costs

Total Domestic Intervention Costs

The capital costs of the interventions and the potential energy savings attributed to the interventions have been estimated (See also Table 7). Costs and emissions for each fuel source used in the analysis are based on those collated by the Energy Savings Trust (2024) and the Department for Energy Security and Net Zero emissions figures. This differs from the data found in SAP and reduced SAP for EPC and Property Energy Analysis Tool (PEAT) calculations as they are not as frequently updated.

Table 23 shows the breakdown of the capital expenditure required per intervention and the effect this intervention has on reducing energy demand across all the East Dunbartonshire Council building stock. For reference, the baseline heat demand per year for the domestic buildings in East Dunbartonshire Council is estimated to be 737,000 MWh. This data helps to identify which measures are the most effective way to reduce heating demand, helping both fuel poverty and heat decarbonisation. Loft insulation upgrade is by far the lowest cost method to reduce heating demands. On the other hand, installing external wall insulation on the outside of buildings that already have cavity or internal wall insulation is deemed as the least cost-effective way to reduce heat demand. However, they may be other reasons for doing less cost-effective measures, such as funding streams being allocated only to specific measures or improving the aesthetics of the building with external wall insulation or window upgrades.

Table 23: Summary of Energy Efficiency Interventions Across all Buildings in East Dunbartonshire

Fabric Measure	Capital Cost (£m)	Heat Demand Reduction (MWh/y)	Cost Effectiveness (kWh/y/£)	Fuel Savings per Investment Cost (£/£)
Cavity Wall Insulation (CWI)	£41,333,348	50,144,939	1.21	0.096
Internal Wall Insulation (IWI)	£8,383,584	5,258,338	0.63	0.051
External Wall Insulation (only wall measure)	£31,650,000	13,880,426	0.44	0.034
External Wall Insulation (alongside CWI or IWI)	£504,045,000	91,355,709	0.18	0.013
All wall insulation measures	£585,411,932	160,639,413	0.27	0.021
Loft insulation upgrade from <100mm	£4,421,592	21,607,824	4.89	0.380
Loft insulation upgrade from 100-250mm	£13,146,600	39,189,822	2.98	0.226
Loft insulation upgrade from 250-300mm	£18,225,288	22,191,954	1.22	0.091
All loft insulation measures	£35,793,480	82,989,600	2.32	0.176
All Single to Double Glazing upgrade	£25,002,000	8,674,579	0.35	0.027
Cylinder insulation upgrade from <50mm	£8,315,250	11,475,045	1.38	0.111
Cylinder insulation upgrade from 50-80mm	£2,934,000	2,159,424	0.74	0.061
All cylinder insulation measures	£11,249,250	13,634,469	1.21	0.098
All Measures	£657,456,662	265,938,061	0.40	0.031

Table 24 describes the total investment cost across the area from replacing the current heating systems with heat pumps. The return on investment from the reduction in annual fuel costs compared to the cost of installing

the heat pump highlights how cost-effective heat pumps can be at reducing fuel poverty. This is particularly the case for buildings currently heated from direct electric, LPG, or Oil. Although the cost of solid fuels may be lower than that of heat pumps, the improvement in air quality from switching away from burning coal may be worthwhile for the residents alongside the decarbonisation benefits.

Total costs are estimated using the cost of individual heat pumps, although some of these may be communal heat pump systems. Of the heat pump suitable dwellings 9,986 are flats, and 621 are flats that are smaller than 60m². These small flats are the ones which may benefit the most from communal heat pump systems as they may struggle to have space for hot water cylinders or equivalent thermal storage that is required alongside an individual heat pump. The Home Analytics dataset does not specifically state if properties currently have a hot water cylinder, if this data becomes available it can be used to further filter down the small flats by ones that don't already have a cylinder to highlight the more challenging properties for individual heat pumps.

Table 24: Summary of Heating Systems Changes Across all East Dunbartonshire

Heating System	Number of Buildings	Heat Pump Suitable	Cost of Heat Pump Installation (£m)	Fuel Savings per Investment Cost (£/£)
Biomass	41	-	-	0.000
LPG	134	118	1,003,000	0.056
Main Gas	44,996	42,806	363,851,000	-0.004
No Fuel listed	67	52	442,000	
Oil	335	288	2,448,000	0.039
Solid	67	64	544,000	-0.003
Unknown	-	-	-	
Direct electric	2,742	2,513	21,360,500	0.136
Heat pump	119	-	-	0.000
All Heating Systems	48,501	45,841	389,648,500	0.004

Table 25 shows all the fabric measures for the dwellings that are owned by the Council. These are all the measures that East Dunbartonshire Council have direct influence over. The scale of the investment required to implement all the energy efficiency measures, let alone changing the heating source, is far beyond what is achievable for the Council, emphasising the important of further specific targeting of measures.

Table 25: Summary of Interventions Across Local Authority Owned Buildings

Measure	Capital Cost (£m)	Heat Demand Reduction (MWh/y)
Cavity Wall Insulation (CWI)	1.79	2,371
Internal Wall Insulation (IWI)	0.49	348
External Wall Insulation (only wall measure)	1.64	680
External Wall Insulation (alongside CWI or IWI)	25.00	4,163
Sum of wall insulation measures	**29.90**	**7,562**
Loft insulation upgrade from <100mm	0.20	980
Loft insulation upgrade from 100-250mm	0.59	1,749
Loft insulation upgrade from 250-300mm	1.14	1,323
Sum of loft insulation measures	**1.93**	**4,052**
Sum of single to double glazing upgrades	**3.13**	**828**
Cylinder insulation upgrade from <50mm	0.63	867
Cylinder insulation upgrade from 50-80mm	0.16	118
Sum of cylinder insulation measures	**0.79**	**986**
Sum of all measures	**35.76**	**13,427**

Heat Pumps, the Running Cost and Carbon Emissions

The cost and emissions of heat is dependent on the quantity of heat demand, the heating system efficiency, and the cost of fuel. These factors can help in reducing fuel poverty and in decarbonisation across East Dunbartonshire Council. Table 26 shows the cost of fuels used in this analysis, this data is those collated by the Energy Savings Trust (July, 2024).

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Table 26: Cost of Fuels Used for this Analysis.

Fuel	Cost (£/kWh)
Biomass	0.085
Solid	0.0.063
Electricity	0.224
LPG	0.0.087
Mains Gas	0.0.055
Oil	0.0.071

Table 27 shows the total annual cost and emissions from heating all the buildings in East Dunbartonshire Council. Heat pumps use a COP of 3, direct electric heating uses an efficiency of 100%, and boilers use an efficiency based on the boiler efficiency from their EPC in the Home Analytics dataset.

Table 27: Annual Cost and Emissions of Heating, in Heat Pump Suitable Properties

	Annual Cost of Heat (£)	Annual Emissions (tCO2e)
Current Scenario	57,240,627	174,539
Current heating system, with all energy efficiency measures, excluding EWI on buildings with CWI or IWI	43,704,967	133,045
Transition to heat pumps in suitable properties, with all energy efficiency measures, excluding EWI on buildings with CWI or IWI	38,224,612	32,999
Heat pumps in 2035 (when grid is zero carbon)		0

Although this analysis uses heat pumps operating at a COP of 3.0, the COP can be improved upon by reducing the flow temperature of the heat pump, resulting in lower cost of heating. Increasing to larger radiators with more thermal power, or convection radiators, allows the buildings heat demand to be met with a lower flow rate. It is recommended for the EDC to trial different radiator packages, to find the optimum trade off from more expensive larger/more powerful radiators against the reduced operational cost from lower flow temperatures. The EPC recognises the benefit of lower flow temperature heat pump systems and improves the score.

The results in Table 27 use a flat rate tariff for simplicity of calculations and to allow for a worst-case low level of consumer engagement with the heating system. If users are more engaged or allow intelligent control systems for the heat pumps to interact with the modern array of tariffs available, there can be significant further benefits for the user, including cost savings, associated emissions reduction and reduction in electrical network demand. These dynamic or variable time of use tariffs reward consumers who shift their demand to off-peak times balancing the renewable energy supply and demands. Heat pumps can use these times of low cost and

low emissions electricity to charge hot water cylinders, they can also be used to maintain a level of temperature in the building, which also has the benefit of reducing the peak heat demand and allowing further lower flow temperatures.

With the current associate emissions from electricity generation, installation of heat pumps makes a significantly larger reduction to heating associated emissions in the EDC than the energy efficiency measures. As the electricity emissions reduce towards the 2035 target of 0 gCO_2/kWh the benefit of heat pumps on emissions reduction increases.

Appendix L Data zone map and table

Figure 82: Data zone map, refer to Table 28

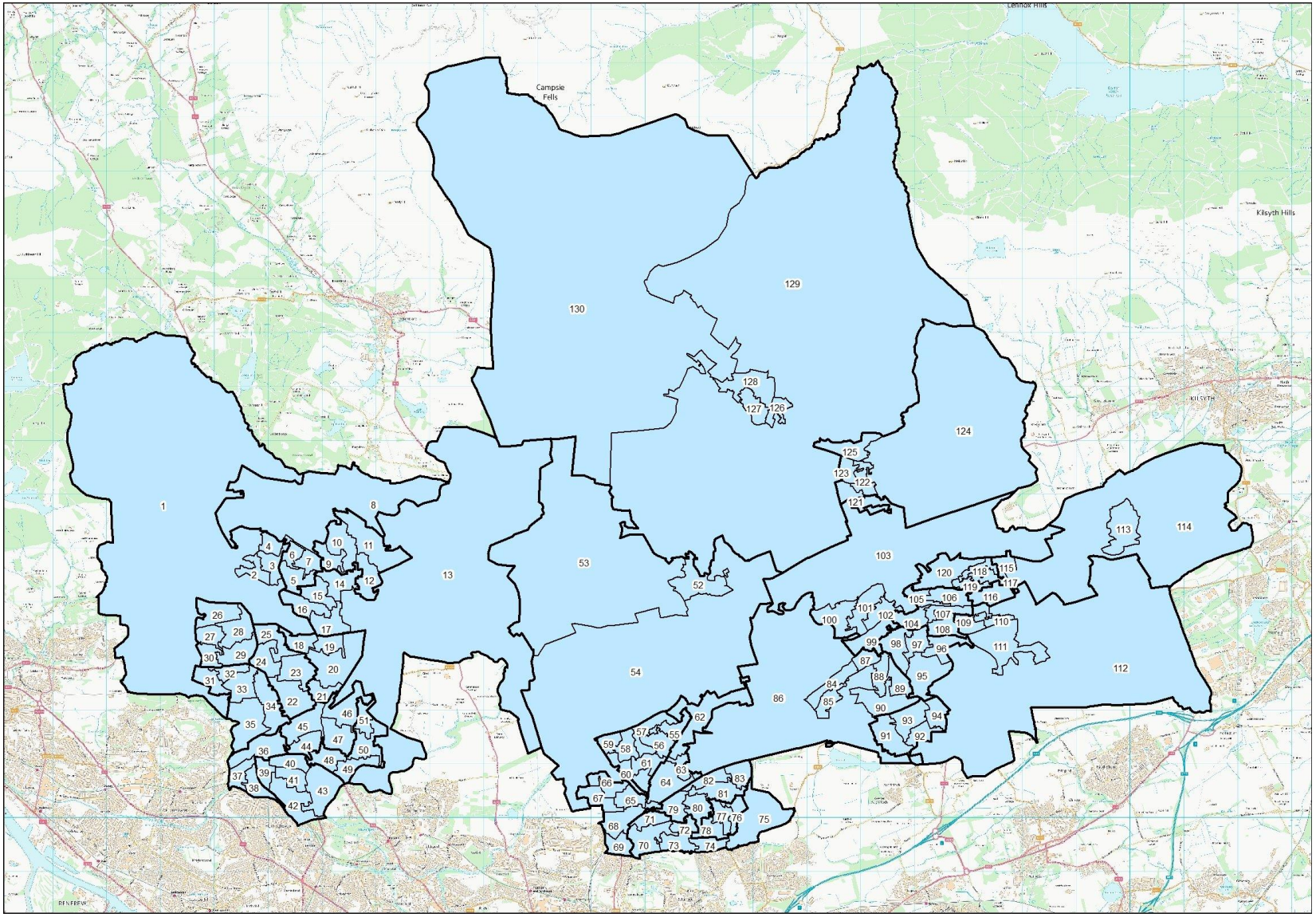

Table 28: Data zone reference table, to accompany Figure 82

Datazone numbering	Datazone numbering	Datazone numbering	Datazone numbering
1: West Clober and Mains Estate - 01	21: Kilmardinny East - 04	41: Westerton East - 03	61: Bishopbriggs North and Kenmure - 07
2: West Clober and Mains Estate - 02	22: Kilmardinny West - 01	42: Westerton East - 04	62: Bishopbriggs West and Cadder - 01
3: West Clober and Mains Estate - 03	23: Kilmardinny West - 02	43: Westerton East - 05	63: Bishopbriggs West and Cadder - 02
4: West Clober and Mains Estate - 04	24: Kilmardinny West - 03	44: Kessington West - 01	64: Bishopbriggs West and Cadder - 03
5: East Clober and Mains Estate - 01	25: Kilmardinny West - 04	45: Kessington West - 02	65: Bishopbriggs West and Cadder - 04
6: East Clober and Mains Estate - 02	26: North Castlehill and Thorn - 01	46: Kessington West - 03	66: Bishopbriggs West and Cadder - 05
7: East Clober and Mains Estate - 03	27: North Castlehill and Thorn - 02	47: Kessington West - 04	67: Bishopbriggs West and Cadder - 06
8: East Clober and Mains Estate - 04	28: North Castlehill and Thorn - 03	48: Kessington East - 01	68: Bishopbriggs West and Cadder - 07
9: Barloch - 01	29: North Castlehill and Thorn - 04	49: Kessington East - 02	69: Bishopbriggs West and Cadder - 08
10: Barloch - 02	30: North Castlehill and Thorn - 05	50: Kessington East - 03	70: Auchinairn - 01
11: Barloch - 03	31: South Castlehill and Thorn - 01	51: Kessington East - 04	71: Auchinairn - 02
12: Barloch - 04	32: South Castlehill and Thorn - 02	52: Torrance and Balmore - 01	72: Auchinairn - 03
13: Keystone and Dougalston - 01	33: South Castlehill and Thorn - 03	53: Torrance and Balmore - 02	73: Auchinairn - 04
14: Keystone and Dougalston - 02	34: South Castlehill and Thorn - 04	54: Torrance and Balmore - 03	74: Auchinairn - 05
15: Keystone and Dougalston - 03	35: South Castlehill and Thorn - 05	55: Bishopbriggs North and Kenmure - 01	75: Auchinairn - 06
16: Keystone and Dougalston - 04	36: Westerton West - 01	56: Bishopbriggs North and Kenmure - 02	76: Woodhill East - 01
17: Keystone and Dougalston - 05	37: Westerton West - 02	57: Bishopbriggs North and Kenmure - 03	77: Woodhill East - 02
18: Kilmardinny East - 01	38: Westerton West - 03	58: Bishopbriggs North and Kenmure - 04	78: Woodhill East - 03
19: Kilmardinny East - 02	39: Westerton East - 01	59: Bishopbriggs North and Kenmure - 05	79: Woodhill West - 01
20: Kilmardinny East - 03	40: Westerton East - 02	60: Bishopbriggs North and Kenmure - 06	80: Woodhill West - 02

Datazone numbering	Datazone numbering	Datazone numbering	Datazone numbering
81: Woodhill West - 03	94: Lenzie South - 04	107: Hillhead - 04	120: Harestanes - 04
82: Woodhill West - 04	95: Kirkintilloch South - 01	108: Hillhead - 05	121: Milton of Campsie - 01
83: Woodhill West - 05	96: Kirkintilloch South - 02	109: Rosebank and Waterside - 01	122: Milton of Campsie - 02
84: Lenzie North - 01	97: Kirkintilloch South - 03	110: Rosebank and Waterside - 02	123: Milton of Campsie - 03
85: Lenzie North - 02	98: Kirkintilloch South - 04	111: Rosebank and Waterside - 03	124: Milton of Campsie - 04
86: Lenzie North - 03	99: Kirkintilloch West - 01	112: Rosebank and Waterside - 04	125: Milton of Campsie - 05
87: Lenzie North - 04	100: Kirkintilloch West - 02	113: Twechar and Harestanes East - 01	126: Lennoxtown - 01
88: Lenzie North - 05	101: Kirkintilloch West - 03	114: Twechar and Harestanes East - 02	127: Lennoxtown - 02
89: Lenzie North - 06	102: Kirkintilloch West - 04	115: Twechar and Harestanes East - 03	128: Lennoxtown - 03
90: Lenzie North - 07	103: Kirkintilloch West - 05	116: Twechar and Harestanes East - 04	129: Lennoxtown - 04
91: Lenzie South - 01	104: Hillhead - 01	117: Harestanes - 01	130: Lennoxtown - 05
92: Lenzie South - 02	105: Hillhead - 02	118: Harestanes - 02	
93: Lenzie South - 03	106: Hillhead - 03	119: Harestanes - 03	

Appendix M List of Funding Opportunities

The listed funding sources are expected to be available in 2024 and are suggested as a guidance and as available at the time of preparing this report. Due to possible changes in funding cycles and availability, each option should be source-checked at the time of application.

Funding scheme	Description	Funding & managing body
Energy Company Obligation (ECO4). - Available until March 2026.	The funding is aimed for home owners (private and social sector) in fuel poverty, to be used for energy efficiency improvements. **Supported actions:** installing heating technologies/ upgrades, insulation improvements (cavity wall, loft, internal wall, etc), installing smart heating controls, actions that could improve the EPC rating.	UK Government; Ofgem and obliged energy suppliers.
Heat Network Fund. -Available until March 2026.	The funding is aimed for all tenures and sectors from both the private and public sectors. **Supported actions:** new low or zero direct emissions district heat networks or communal heating systems.	Scottish Government.
Heat Network Support Unit. -Available until March 2026.	The funding is aimed for the public sector where projects meet the definition of a district or communal heat network, as defined by the Heat Networks (Scotland) Act 2021. Applications that require spending over multiple financial years will be considered. **Supported actions:** heat network support that can cover up to 90% of the costs (capped at £150,000), requiring a 10% contribution from the Council. The support consists of - 1. Commercial and financial analysis of heat network opportunities; 2. Identification of investment opportunities; 3. Management of private sector stakeholder engagement; 4. Identification of delivery models; 5. Building of long-term business cases. •	Scottish Government; Scottish National Public Energy Agency (Heat Network Support Unit).
Scottish National Investment Bank. Also see projects at Scottish National Investment Bank (thebank.scot).	The funding is aimed for companies and low carbon infrastructure projects and is delivered in partnership with private sector investments. **Supported actions:** long-term financial support for projects throughout Scotland to support a just transition to net zero and innovation.	Scottish Government; Scottish National Investment Bank.
Scotland's Heat Network Fund (SHNF). Also see Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022).	The funding is aimed for businesses and organisations in the public, private and third sectors. **Supported actions:** deployment of new low/ zero emission district and communal heat networks as well as support the decarbonisation and extension of current heat networks.	Scottish Government

-Available until 2025/26.		
Social Housing Net Zero Heat Fund (Low Carbon Infrastructure Transition Programme). See Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022). - Available until 2026.	The funding is aimed for registered social housing landlords and local authorities. **Supported actions:** retrofit or refurbishment of social housing projects for deploying zero direct emissions heating systems and improving energy efficiency (through a fabric first approach) to assist fuel poverty reduction targets.	Scottish Government
Green Public Sector Estate Decarbonisation. See Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022). -Available from until 2025/26.	The funding is aimed for Scotland's public sector. **Supported actions:** multi-year projects to continue to boost heat decarbonisation and energy efficiency improvements.	Scottish Government
SME Loan Scheme (Through Heat in Buildings Grants and Loans - formerly Heat in Buildings Capital Investment). See Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022) -Available until 2025/26.	The funding is aimed for eligible businesses and not-for-profit organisations defined as small and medium-sized enterprises. **Supported actions:** eligible heat decarbonisation measures (including installation of renewable technologies) and energy efficiency improvements (including insulation and equipment upgrades).	Scottish Government
Clyde Mission Heat Decarbonisation Fund. See Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022); Also see Clyde Mission - Glasgow City Region. -Available until 2025/26.	The funding is aimed for all sectors operating in the Clyde Mission area and links with the Glasgow City Region - City Deal. **Supported actions:** delivery of zero/ low carbon heat projects (including district and communal heat networks, and development of brownfield sites for jobs and housing) along the River Clyde.	Scottish Government
Scottish Industrial Energy Transformation Fund (SIETF) Also see Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022). -Available until 2025/26.	The funding is aimed for manufacturers and the industry sector. **Supported actions:** implementing investment-ready energy efficiency technologies and/or decarbonisation at their industrial sites; feasibility and engineering studies into energy efficiency or deeper decarbonisation.	UK Government; Scottish Government
Energy Transition Fund. Also see Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022).	The funding is aimed for local businesses in the energy sector. **Supported actions:** investments in the Northeast, economic resilience (against the	Scottish Government.

-Available until 2024/25	impacts of Covid-19) and progress on energy transition to assist net zero targets by 2045.	
Emerging Energy Technologies Fund (EETF) See Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022). - Available until 2026.	The funding is aimed for companies and innovations in renewable energy technology. It also supports the Hydrogen Innovation Scheme. **Supported actions:** carbon capture and storage (CCS), negative emissions technologies (NETs), and green hydrogen production and delivery.	Scottish Government
Scotland's Public Sector Heat Decarbonisation Fund -Expected to open for the 2025/26 financial year applications.	The funding is aimed for local authorities, arm's length external organisations and universities. **Supported actions:** decarbonise the heating systems and energy efficiency measures that provide cost savings.	Scottish Government; Salix Finance
Home Energy Scotland (HES) Grant and Loan	The funding is aimed for owner occupiers. **Supported actions:** energy efficiency measures (up to 75% of costs) installing clean heating systems (from a specified list) and connections to a renewably powered heat network scheme.	Scottish Government; Energy Saving Trust
Energy Efficient Scotland: Area Based Schemes (ABS) (under Heating in Buildings Grants and Loans through the Home Energy Scotland - Energy Efficient Scotland Domestic programmes). Also see Area-Based Schemes - gov.scot (www.gov.scot); Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022) -Available until 2025/26.	The funding is aimed for local authorities who deign and deliver the schemes with local delivery partners. It supports home owners and registered social landlords by blending the funds to support insulation upgrades. **Supported actions:** energy efficiency measures targeting areas facing fuel poverty (through measures such as solid wall insulation) and reducing emissions from the housing stock by investing in domestic energy efficiency and zero emission heating systems.	Scottish Government; Energy Saving Trust
Warmer Homes Scotland (WHS) (under Heat in Buildings Grants and Loans through Home Energy Scotland - Energy Efficient Scotland Domestic programmes). See Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022). -Available until 2025/26.	The funding is aimed for qualifying owner occupiers. WHS is currently delivered by Warmworks and the successor scheme will have a greater focus on decarbonisation and increased spend per intervention. **Supported actions:** energy efficiency measures (including wall and loft insulation and draught-proofing), heating system upgrades and deploying renewables.	Scottish Government; Energy Saving Trust
Home Energy Efficiency Programmes for Scotland (HEEPS) Loan Scheme	The funding is aimed for Registered Social Landlords. It provides up to £1 million in loans to assist necessary improvements to meet the Energy Efficiency Standard for Social Housing (EESSH).	Scottish Government; Energy Saving Trust

	Supported actions: energy efficiency improvements, renewables and associated repairs (from specified list).	
Private Rented Sector Landlord Loan	The funding is aimed for registered private landlords. **Supported actions:** energy efficiency improvements and renewable measures.	Scottish Government; Energy Saving Trust
Smart Export Guarantee Also see Smart Export Guarantee (SEG) | Ofgem	The funding is aimed for homes and businesses with eligible installations located in Great Britain. **Supported actions:** payments for feeding excess electricity (generated on site through eligible renewable sources such as solar PV) back into the grid.	UK government; Energy suppliers (SEG licensees); Ofgem
Social Housing Net Zero Heat Fund -Available until 2026.	The funding is aimed for registered social landlords and local authorities. **Supported actions:** installing renewables and energy efficiency measures.	Scottish Government
CARES (Community and Renewable Energy Scheme) - Let's Do Net Zero Community Buildings Fund -Available until February 2025. Also see Energy Infrastructure Investment Plan 2021-22 to 2025-26: programme pipeline update (Sep 2022)	The funding is aimed for eligible community, faith and charity organisations. **Supported actions:** installing renewables (such as air source heat pumps and solar panels, including technical feasibility studies for energy generation) and energy efficiency measures in community buildings, community benefits and shared ownership projects.	Scottish Government
Warm Homes Fund (WHF) See Affordable Warmth Solutions	The funding is aimed for social housing providers, local authorities and other organisations working in partnership with them, to address some of the issues affecting fuel poor households. **Supported actions:** gas and low running cost heating installations.	National Grid and Community Interest Company, Affordable Warmth Solution
Energy Industry Voluntary Redress Scheme	The funding is aimed for charities, community interest companies, cooperative societies and community benefit societies. **Supported actions:** household energy efficiency improvements to providing advice for consumers to keep on top of their bills.	Payments and energy companies who may have breached rules; Energy Saving Trust on behalf of Ofgem
Warm Homes Discount – Industry Initiatives -Available until March 2026.	The funding is aimed for owner occupiers who are on low-income and who are vulnerable to cold-related illness or living, wholly or mainly, in fuel poverty. **Supported actions:** gas boiler repair, replacement and other support delivered through specific schemes.	Energy suppliers; Ofgem

Great British Insulation Scheme	The funding is aimed for homeowners, landlords and tenants to improve home energy efficiency and reduce energy bills. **Supported actions:** insulation (including wall, loft, roof and floor insulations) for energy efficiency improvements in properties with an EPC rating of D to G and within Council Tax bands A to E.	UK Government.
Octopus Renewables Infrastructure Trust (ORIT) Impact Fund - May be open for a fifth year of funding.	The funding is aimed for any sector **Supported actions:** innovations and initiatives (through grants and volunteering support) to improve the environment and support communities reach a just transition to clean energy while helping to alleviate fuel poverty.	Octopus Renewables Infrastructure Trust.
Climate Action Fund - Available at least until end of 2024.	The funding is aimed for cross-sector partnerships led by eligible community, voluntary or public organisations (including local authorities). **Supported actions:** climate action linking with everyday lives of local communities (including those facing poverty and other disadvantages) that could influence at a regional and national level.	The National Lottery Community Fund.
Grants for Good Fund	The funding is aimed for eligible local community groups and charity, voluntary group or social enterprises. The funding is granted every 3-months, awarding £60,000 per year. **Supported actions:** projects demonstrating innovation, scalability and impact on communities or the environment.	John Good Group.
The SUEZ Communities Fund – Scotland	The funding is aimed for projects in sites located within 10 miles of a landfill site and has an annual budget of £200,000. **Supported actions:** supports community and environmental improvement projects.	SUEZ Recycling; Recovery UK; Scottish Landfill Communities Fund.

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