North Ayrshire Council

Local Heat and Energy Efficiency Strategy

North Ayrshire Council
Comhairle Siorrachd Àir a Tuath

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1. Executive Summary

Executive Summary

As part of the national progress towards decarbonisation, 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 to identify and address heat demand and areas of poor energy efficiency.

This Strategy is primarily driven by Scotland's statutory targets[2]:

- Net zero emissions by 2045 with a 75% reduction by 2030; and
- By 2040, as far as reasonably possible, that no more than 5% of households will be in fuel poverty and no more than 1% of households in Scotland will be in extreme fuel poverty.

Alongside Scottish legislation, the Council has stated the ambition to achieve net-zero by 2030 in our Council Plan 2023-28[3] by embedding net zero ambitions in all democratic decision making. Furthermore, the Council's Sustainable North Ayrshire (SNA) strategy 2024-27[4] aims to tackle the climate emergency and nature crisis. The Energy workstream links directly to the LHEES and will focus on reducing emissions and encouraging low carbon behaviours in relation to energy use. The SNA aims to continue to reduce the carbon footprint of our estate through rationalisation utilising a locality-based approach and taking a fabric first and low carbon energy generation approach to homes and buildings.

The Council commissioned Ricardo to develop the LHEES Strategy and the Delivery Plan in accordance with the Scottish Government's prescribed methodology, utilising the Scottish Government's Home Analytics and Non-Domestic Analytics datasets, and the outputs of the first national assessment of heat networks.

This provided an understanding of the current heat demand across North Ayrshire and identified routes to improve energy efficiency and decarbonise heat demand. To align with Council policies and plans, the Council's six localities have been used as Strategic Zones to illustrate the findings and identify the delivery actions.

Engagement with stakeholders was undertaken, both within the Council and with external stakeholder representatives. The findings of these engagement sessions were considered in development of the Strategy and Delivery Plan.

LHEES Findings

Within the North Ayrshire area:

- 88% of domestic properties use fossil fuels. 83.5% are on mains gas with the remainder 4.5% using oil, liquified petroleum gas (LPG) and solid fuels
- 11.2% use electric heating (with 7% of those being heat pumps)
- 0.2% are heated by biomass

[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] Our Council Plan (north-ayrshire.gov.uk)
[4] Sustainable North Ayrshire 2024-27

The energy ratings for domestic properties were investigated. This provided a baseline showing that 40% of North Ayrshire properties will require a heating or energy efficiency intervention to increase their Energy Performance Certificates (EPCs) to C or better.

The investigation of North Ayrshire's domestic housing stock identified that around 45,000 individual energy efficiency interventions (improvements to glazing, wall insulation and loft insulation) could be made. Table 1 lists the strategic zones and the energy efficiency interventions required.

Table 1: Potential Domestic Energy Reduction Interventions

Strategic Zone	Add Loft Insulation	Glazing Upgrade	Add Wall Insulation	All
Arran	748	319	2,308	**3,375**
Garnock Valley	1,003	1,332	5,122	**7,457**
Irvine	1,199	1,585	6,592	**9,376**
Kilwinning	702	532	3,014	**4,248**
North Coast and Cumbraes	1,568	876	8,232	**10,676**
Three Towns	1,447	1,540	6,824	**9,811**
Total	6,667	6,184	32,092	**44,943**

Table 2 summarises the potential heat demand reduction of 430 GWh/year or 57% after installing the energy efficiency interventions.

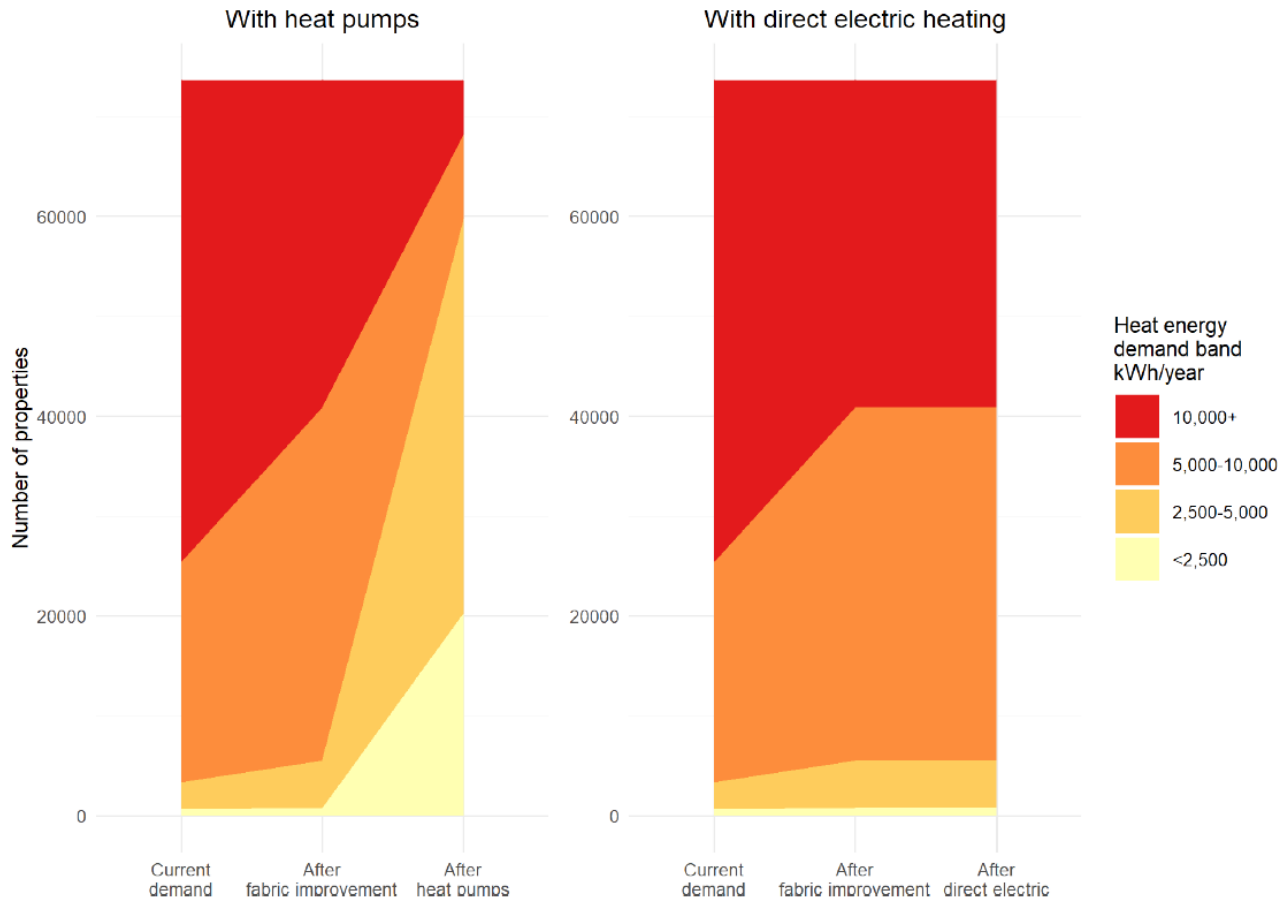
Table 2: Potential Energy Savings Associated with Reduction Interventions

Measure	Heat Demand Reduction (kWh/y)
All loft insulation measures	103,900,000
All cylinder insulation measures	20,600,000
All Single to Double Glazing upgrade	8,700,000
All wall insulation measures	195,500,000
All Combined Measures	**430,300,000**

Fuel Poverty

Fuel poverty resulting from poor energy efficiency is uneven across North Ayrshire (the three geographical zones which stand out are Arran-04, Largs and Central Cumbrae-06 and 07). Installation of energy efficiency interventions would help reduce the risk of fuel poverty. A range of low carbon heat sources were identified, which include heat pumps and direct electric heating (e.g. panel heaters or storage heaters). Installing more efficient low carbon heat sources, such as heat pumps, would allow heat to be decarbonised and reduce energy demand. However, energy prices can impact the viability of installing low carbon heat sources. In Figure 1, both halves show the domestic properties in North Ayrshire, grouped into bands of annual heat demand and the changes in numbers of properties in each band when energy efficiency measures or new heating systems are installed. In the left half, the number of properties shifting to lower demand bands after heat pump installation is significant and the change is greater than the impact of energy efficiency measures. In the right half, however, direct electric heating makes no difference to demand.

Figure 1: The Impact of Fabric Improvements and Heat Pumps on Domestic Energy Demand



Heat pumps and District Heating have been identified as being important solutions to decarbonise domestic heat demand in North Ayrshire. It has been identified that more than half of the homes in North Ayrshire would be suitable for heat pumps today. However, by installing energy efficiency interventions in the first instance would mean an estimated 90% of properties would be heat pump ready. The remainder may need alternative or bespoke solutions.

Table 3 shows that by installing energy efficiency interventions, emission reductions could be approximately 50,000 tCO2e and cost of heat savings of £33.2m. Further savings could be achieved by installing heat pumps of approximately 168,000 tCO2e/year and cost of heat savings of £61.1m.

Table 3: Reductions in Energy Cost and Carbon Emissions with Energy Efficiency Measures and Heat Pump Installations

Scenarios	**Annual Cost of Heat (£)**	**Annual Emissions (tCO_2e)**
Current Scenario	134,300,000	210,000
Current heating system, with all energy efficiency measures, excluding External Wall Insulation (EWI) on buildings with Cavity Wall Insulation (CWI) or Internal Wall Insulation (IWI)	101,100,000	160,000
Transition to heat pumps in suitable properties, with all energy efficiency measures, excluding EWI on buildings with CWI or IWI	73,200,000	42,000

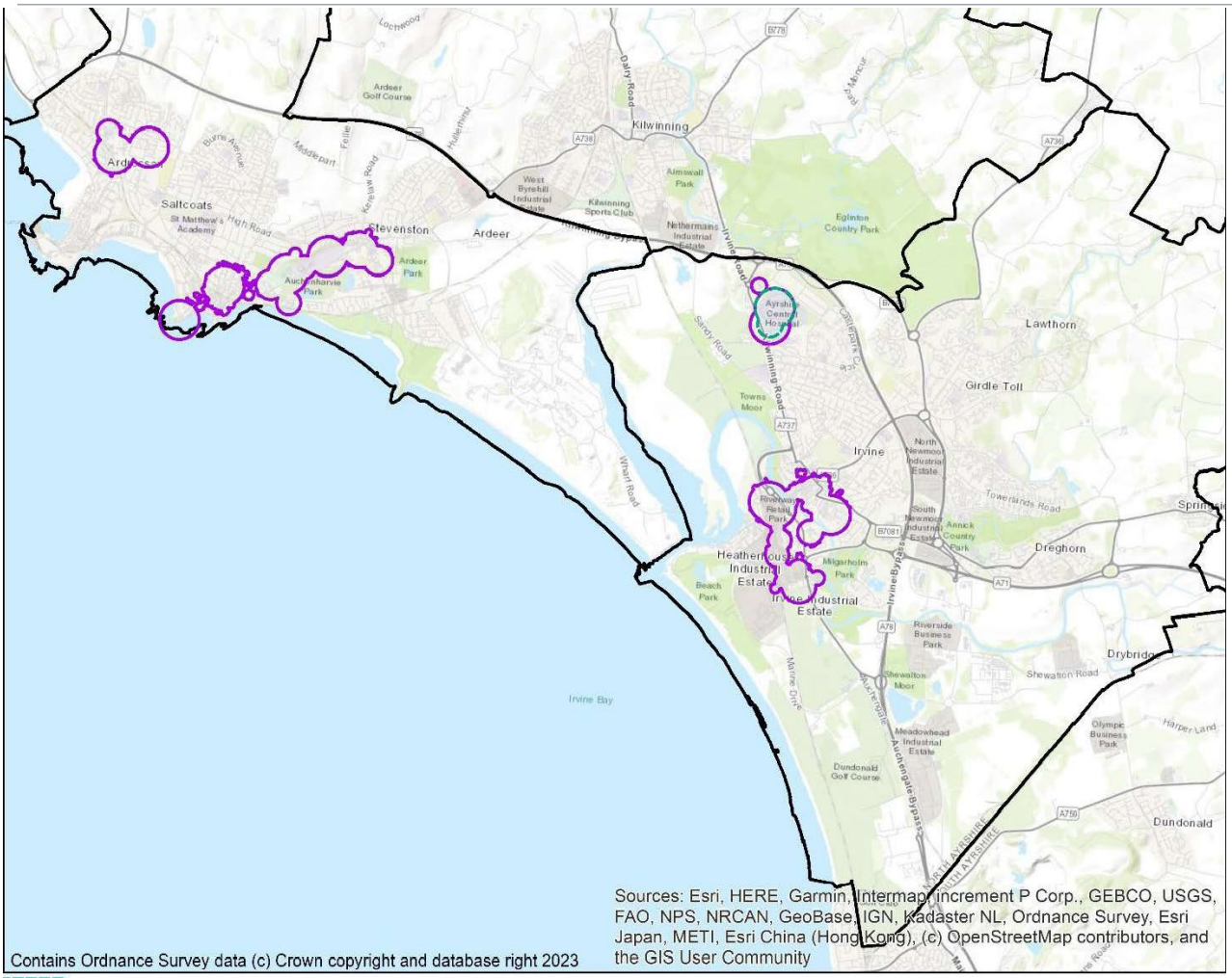
District Heating

Heat network analysis has identified five potential zones (Figure 2 & Figure 3) where District Heating Networks could be the most economically viable and deliver low-carbon heat to homes and businesses in North Ayrshire. Selected on the basis of having reliable anchor buildings, a high density of potential customers and a suitable total heat demand, the five zones are:

- Ardrossan – potential to include 704 domestic properties.
- Saltcoats – potential to include 197 domestic properties.
- Irvine-1 – potential to include 563 domestic properties.
- Irvine-2 – potential to include 15 domestic properties and Ayrshire Central Hospital.
- Largs – potential to include 924 domestic properties.

While it may be possible in the future to extend district heating networks, further detailed investigation would be required to identify additional areas. North Ayrshire has a relatively low density of heat demand which can reduce the opportunities for district heating networks.

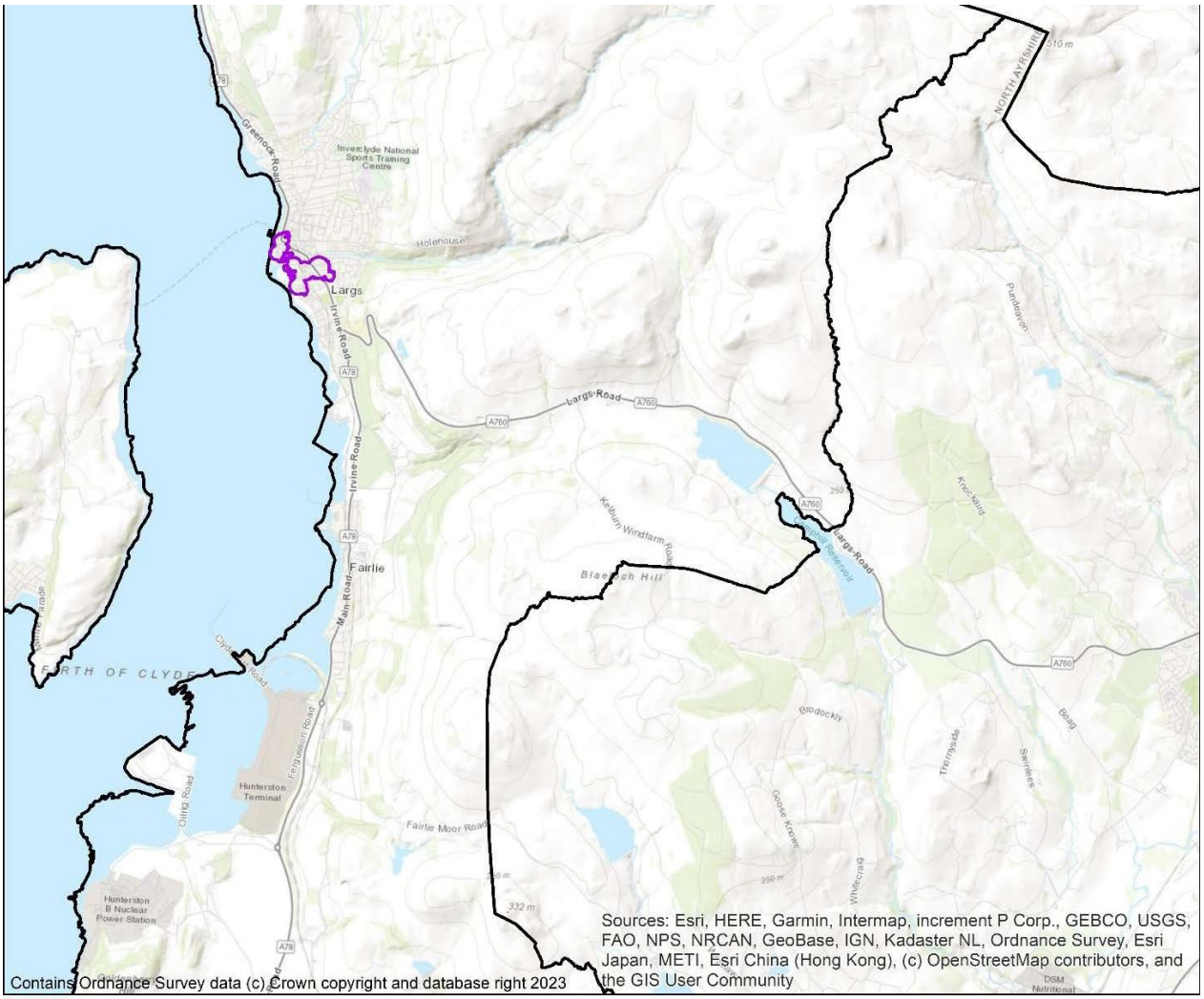
Figure 2: Potential Heat Network Zones in Ardrossan, Irvine and Saltcoats



8,000kWh/m and total demand over 15,000MWh (Stringent)

4,000kWh/m and total demand over 15,000MWh (Baseline)

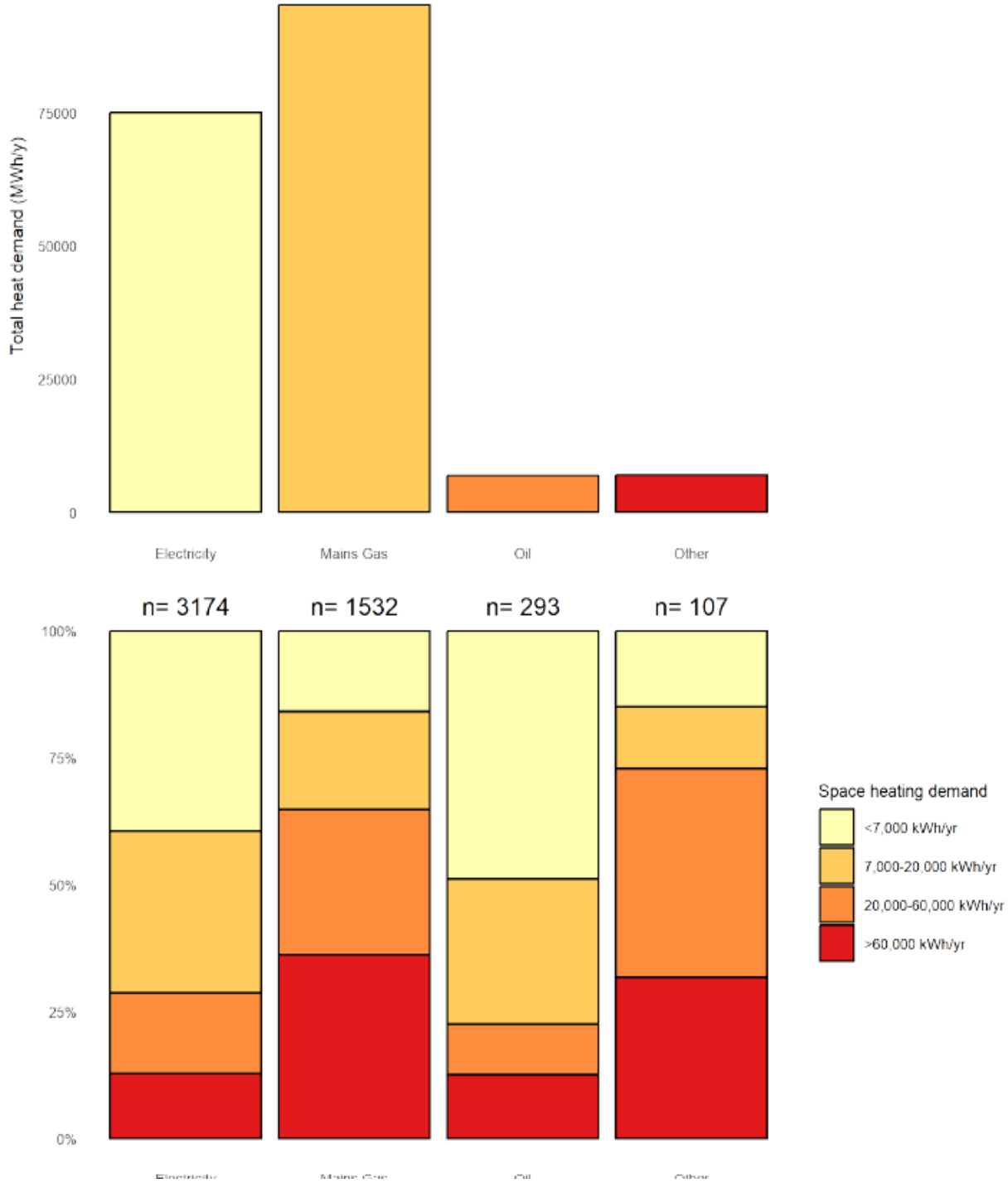
Figure 3: Potential Heat Network Zone in Largs



The cost of reducing energy demand, reducing fuel poverty and decarbonising heat supply has been calculated. Domestic energy efficiency measures are estimated to cost approximately £900m, which includes £113m for North Ayrshire Council's stock. The conversion to low-carbon heat sources is estimated to cost £560m which includes £90m for North Ayrshire Council's stock.

Investigation of current non-domestic datasets has realised that further data collection and investigation will be required. Available data suggests that heating is provided from gas, electricity and oil. However electricity and oil have the largest share of small heat loads and smaller buildings account for half of the total heat demand (Figure 4).

Figure 4: Non-Domestic Heat Demand by Fuel



LHEES Delivery Plan

The Delivery Plan sets out the proposed actions that the Council will aim to progress. The Delivery Plan is a working document with actions to assist the delivery of net zero and reduce fuel poverty across North Ayrshire. The Delivery Plan will allow the Council to monitor and evaluate its progress over the five year cycles of the LHEES Strategy.

The initial actions include:

- Within North Ayrshire Council's estate, prioritise energy efficiency interventions and heat pumps, where appropriate.

- Maximise external funding to support the delivery of energy efficiency interventions and heat pump installations within the wider Council area.
- Development of feasibility studies for the five identified heat network zones.
- Identify and provide advice and support for domestic and non-domestic property owners within the North Ayrshire area.

Energy efficiency measures, heat pumps and heat networks have the potential to significantly reduce energy demand, reduce the risk of fuel poverty and decarbonise heat across North Ayrshire. Property suitability, available technologies and local skillset will inform future decisions and assist the Council in achieving our net zero ambitions.

The LHEES Officer and LHEES Working Group will bring together action from across the Council which are within the scope of LHEES to identify opportunities for shared working, meeting the LHEES objectives and Community Wealth Building (CWB).

2. Abbreviations

Table 4: Abbreviations

Acronym	Description
BRE	Building Research Establishment
COP	Coefficient of Performance
EES	Energy Efficient Scotland
EES: ABS	Energy Efficient Scotland: Area Base Schemes
EESSH	Energy Efficiency Standard for Social Housing
EPC	Energy Performance Certificate
EST	Energy Saving Trust
GHG	Greenhouse Gas
GIS	Geographic Information System
HIBS	Heat in Buildings Strategy
IZ	Intermediate Zone
LA	Local Authority
LHEES	Local Heat and Energy Efficiency Strategy
LPG	Liquefied Petroleum Gas
Mxd	Map Exchange Document
NAC	North Ayrshire Council
PEAT	Property Energy Analysis Tool
RSL	Registered Social Landlord
SAP	Standard Assessment Procedure
SNA	Sustainable North Ayrshire Strategy 2024-27
UPRN	Unique Property Reference Number

3. Introduction

3.1 Overview of LHEES

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022[5] places a duty on Local Authorities (LAs) to prepare and update a Local Heat and Energy Efficiency Strategy (LHEES) and Delivery Plan. This document is prepared by North Ayrshire Council (NAC) to fulfil its duty under that Order.

The Strategy sets out the Council's long-term plan for decarbonising heat and improving the energy efficiency of both domestic and non-domestic buildings throughout North Ayrshire.

Primarily driven by Scotland's statutory targets for the reduction of Greenhouse Gas (GHG) emissions and fuel poverty[6]:

- Reaching Net zero emissions by 2045 with 75% reduction by 2030; and
- By the end of 2040, no more than 5% of households in Scotland will be in fuel poverty and no more than 1% in extreme fuel poverty.

The Strategy will:

- Set out the requirements of our current building stock and the changes that are required to meet national and local objectives, including achieving zero GHG emissions 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 the delivery of measures, against national and local priorities.

A Delivery Plan accompanies the Strategy and has been developed, in partnership with key stakeholders, to provide 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.

[5] The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 (legislation.gov.uk)

[6] Local heat and energy efficiency strategies and delivery plans: guidance - gov.scot (www.gov.scot)

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. This document sets out the long-term Strategy and the accompanying Delivery Plan sets out actions to support implementation of this Strategy.

4.1.2 LHEES Considerations

The LHEES Guidance sets out the key Considerations for the Strategy, shown in Table 6. These help to categorise building stock into groups that require similar interventions. The Strategy will look at each Consideration and detail North Ayrshire Council's baseline and pathways.

Table 5: LHEES Considerations

Interventions	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	Identify where energy demand of buildings can be reduced by installing fabric improvements
Energy efficiency and other outcomes	5	Poor building energy efficiency as a driver for fuel poverty	Identify where energy efficiency improvements can contribute to reducing fuel poverty
Energy efficiency and other outcomes	6	Mixed-tenure, mixed-use and historic buildings	Identify buildings with factors which may complicate deployment of energy efficiency measures or low carbon heat sources, such as: properties of varying tenures or uses; listed buildings; and conservation areas.

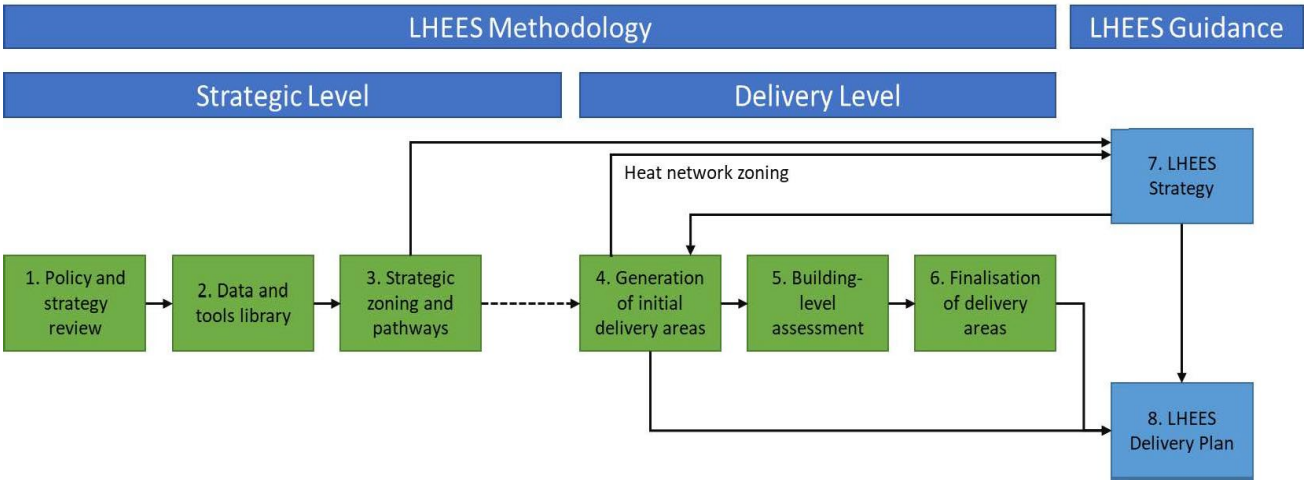
4.1.3 LHEES Approach

LHEES methodology is supplied by the Scottish Government as shown in Figure 6. Although the approach used is based on the proposed methodology shown below, the details have

been adjusted to suit the specific context of North Ayrshire. 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 North Ayrshire with the data analysis and evidence base to enable development of this Strategy (Stage 7) and the accompanying Delivery Plan (Stage 8) document. The 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 5: Summary of LHEES Approach and Stages



4.2 Strategy Scope and Limitations

The Strategy scope focuses on heat decarbonisation, energy efficiency and the reduction of fuel poverty, it does not include wider energy system planning, but the LHEES will be used as a building block for wider LA energy planning.

National data sets, local data and knowledge have been used to build North Ayrshire's LHEES. 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, which is primarily based on Non-Domestic Analytics, is less reliable overall due to dataset gaps and there being more diverse types of non-domestic buildings than domestic.

For this reason, it is not possible to be as detailed in the analysis of non-domestic buildings as domestic buildings.

4.3 Engagement and Consultation

North Ayrshire Council consulted with stakeholders as part of developing this Strategy and have sought input through a range of groups at key points in the development of the Strategy and Delivery Plan.

4.3.1 Internal stakeholders

Engagement with internal stakeholders was undertaken at the end of Stage 3 LHEES analysis, to explain the role of LHEES to stakeholders from across the Council and discuss approaches to LHEES Strategic zoning. The decision to use Localities in the analysis was agreed as it allows alignment with other policy actions being undertaken by the Council.

An internal stakeholder workshop was undertaken to make sure impacted departments were aware of the LHEES process, seek feedback on policies, strategies to be reviewed and external stakeholders to be consulted.

Further engagement sessions were undertaken to share results of the analysis and agree an approach to actions.

A key finding from this engagement was the need to ensure that any performance indicators used, such as those that may impact the Energy Efficiency Standard in Social Housing (EESSH), align with the need for real world impact in decarbonising heat and reducing fuel poverty.

An approach was agreed for LHEES targets to be coordinated through the Working Group so that future policy, strategy or capital spend developments can be discussed with the LHEES forum to maximise any positive impact on the LHEES priorities and carry out actions from the Delivery Plan.

Opportunities to use the LHEES analysis and Strategy to inform future capital spend planning on LHEES planning were specifically discussed, however the risk was identified that there may be competing priorities between the need to maximise improvement to EPC ratings for EESSH and the need to maximise real-world impact in LHEES.

4.3.2 External stakeholders

The list of external stakeholders was developed through discussions with representatives from across the Council.

Engagement with businesses

The Council Business Support and Development Team have a high level of engagement with businesses in North Ayrshire. Since there is also engagement with businesses as part of the Ayrshire Energy Masterplan, additional stakeholder engagement with businesses was not undertaken. However, opportunities and feedback from engagement by the Business Support and Development Team are reflected in the Strategy.

Private landlords

Feedback from private sector landlords focused on concerns surrounding their Scottish Government Regulations requiring the energy efficiency of rental properties to be improved[7].

In particular, there were concerns expressed about hard-to treat properties, the availability of skilled contractors to undertake the work as well as having clarity on which measures contribute to an improvement on EPC rating.

Tenants and community groups

Through engagement with tenants and community groups the Council heard:

- That there is a need for new technologies to be suitably explained to householders to ensure they can get the best out of them.
- New technologies should be as easy to use as possible.
- The benefits of any technologies and the potential resulting disruption must be made clear.

[7] Energy efficiency in homes - Energy efficiency - gov.scot (www.gov.scot)

- There is an opportunity to use posters in community spaces to share information in advance of any works to keep people informed and to share good practice guidance.
- For heat networks, heat pricing is of key importance to tenants.
- Tenants in mixed tenure buildings had experienced having difficulty in upgrading their properties due to a failure to come to an agreement with other tenants in the building.

Housing associations

Contact was made with housing associations to seek their input and a number of points were raised:

- Housing associations with properties in other parts of Scotland had very positive experiences with a large number of heat pump retrofit projects, particularly in the Highlands.
- The same housing association had previously had poor experiences with heat pump projects, however the findings from this were used to inform subsequent heat pump projects, particularly through improved communication with householders on how to use the new systems.
- There is an opportunity for housing associations with experience on heat pump installation and operation to share good practice with the Council and others.

Other points raised

Several stakeholder groups raised the opportunities for Community Wealth Building by increasing the number of skilled installers in the area, to both meet the need in coming years and to ensure that as much of the benefits of that work being undertaken are felt by the communities in North Ayrshire as is possible.

5. LHEES Content and Context

5.1 Governing Legislation

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 heat planning. Both must be kept under review and updated at five yearly intervals.

The six LHEES Considerations, as outlined in Section 4.1.2, are split into two strands, namely ‘heat decarbonisation’ and ‘energy efficiency’. Each of these should be examined to set out the long-term plans across the entire North Ayrshire local authority area.

5.2 Other Legislation

Table 6 below sets out relevant legislation at both UK and national level.

Table 6: Other legislation

UK Wide	National – General	National – Public Sector Specific
The Climate Change Act 2008 (2050 Target Amendment) Order 2019: Net Zero GHG Emissions by 2050.	The Heat Networks (Scotland) Act 2021, which was followed by the Heat Network Delivery Plan, has targeted for 2.6 TWh to be supplied by heat networks by 2027 and 6 TWh by 2030. By October 2023, Scottish Ministers are 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. The Fuel Poverty (Targets, Definition and Strategy) (Scotland) Act 2019 which both defines fuel poverty and sets targets for fuel poverty eradication by 2040, with interim targets for 2030 and 2035. 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 Change (Scotland) Act 2009: Public bodies have a duty to contribute to Scotland's national emission reduction target. Climate Change (Emissions Reduction Targets) (Scotland) Act 2019: 75%	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. Scottish Government and Scottish Green Party: draft shared policy programme 2021): 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

UK Wide	National – General	National – Public Sector Specific
	emissions reduction by 2030, 90% emission reduction by 2040, and net zero GHG emissions by 2045. Update to the Climate Change Plan (2018-2032) By 2030 at least 50% Scotland's building stock heated using zero emission systems. Retrofit buildings and achieve ultra-high levels of fabric efficiency in new builds. Reduce car kilometres by 20% by 2030. Scottish Government Climate Change Plan Update - Securing a Green Recovery on a Path to Net Zero (2020): Focus on green recovery to deliver net zero ambitions following the Covid-19 pandemic. Emphasis on green jobs, adaptation, and tackling fuel poverty. By 2040, no more than 5% of households in fuel poverty, and no more than 1% in extreme fuel poverty. Scottish Government Hydrogen Action Plan (2022): Ambition of 5GW of hydrogen production capacity by 2030 and 25GW by 2045. Climate Emergency Skills Action Plan (Skills Development Scotland / Scottish Government) (2020): Local Authorities are	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. 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): Decarbonise estate by 2038 at the latest, with zero carbon direct emissions from all buildings. Any fugitive emissions that can be reduced to absolute zero must be, however some areas of fugitive emissions may not be able to be reduced to absolute zero by 2045. Public sector bodies must set emissions reduction targets for indirect emissions (such as business travel).

UK Wide	National – General	National – Public Sector Specific
	lead partners on Priority Area 1: Supporting a green labor 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. Scotland's fourth National Planning Framework (NPF4) Encourage the reuse of brownfield, vacant and derelict land for new developments. Draft Energy Strategy and Just Transition Plan (2023): "More than 20GW of additional renewable electricity on- and offshore by 2030".	

5.3 Heat Decarbonisation – Scottish Government Policy

The Scottish Government's Climate Change Plan update was published in December 2020[8]. The next full plan is due to be completed by early 2025. To achieve net zero by 2045, Scotland has committed to reducing emissions by 75% (compared to 1990) by 2030. As part of this, around 50% of homes and non-domestic buildings will need to convert to a low or zero carbon heating system by 2030. An investment of £1.6 billion has been earmarked for heat and energy efficiency over the next Parliament[9].

The Scottish Government also published a Heat in Building Strategy (HIBS)[10] which 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. 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, up from today's estimated 4% level.

These policies feed into the LHEES Considerations of:

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

5.4 Energy Efficiency – Scottish Government Legislation

Tackling Fuel Poverty in Scotland: A Strategic Approach[11] 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 will likely have an impact on the grading of the building stock and the effect of measures[12]. The Fuel Poverty Act 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 and no more than 1% are in extreme fuel poverty and the fuel poverty gap is no more than £250 (in 2015 prices).

The Scottish Government will require that all residential properties in Scotland achieve EPC C 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 D. For the owner occupier sector, new energy efficiency regulations will be introduced between 2023 to 2025.

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.

[8] Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot (www.gov.scot)
[9] Increased funding to tackle fuel poverty and climate change - gov.scot (www.gov.scot)
[10] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[11] Tackling fuel poverty in Scotland: a strategic approach - gov.scot (www.gov.scot)
[12] Energy Performance Certificates - Energy efficiency - gov.scot (www.gov.scot)

5.5 Heat Decarbonisation Intervention Considered

There are a range of potential low carbon heat sources which are likely to play a role in the LHEES. A technology agnostic approach was taken to consider the full range of technologies without bias, weighing up the advantages and disadvantages of each measure on fuel poverty and decarbonisation. In assessing the impact of interventions (Table 7) this Strategy considers energy consumption of properties (in kWh) and the specific energy demand (kWh/m^2). The resulting improvement in Energy Performance Certificate (EPC) rating or Standard Assessment Procedure (SAP) score are not considered. This is because the rating improvement associated would change with future methodological changes. Some changes are already planned, and these methodologies may change a number of times. 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 7: Heat Decarbonisation Interventions

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
Energy Efficiency	Measures such as double glazing and insulation reduce energy demand.	Reducing energy demand of properties, including through energy efficiency, contributes to reducing the risk of fuel poverty. Grants and loans are available through Home Energy Scotland. Targeted funding is available for low income households and those vulnerable to the cold.	Where feasible and cost-effective, the HIBS aims for all homes to have the at least the equivalent of EPC band C by 2033
Heat Pumps	Heat pumps use electricity to extract heat from the air or ground. Grid electricity is continuing a trend of decarbonisation through renewable	Appropriately designed and well-running heat pumps can reduce costs, particularly with regards to electric heating. Savings are dependent upon the relative price of electricity to the fuel displaced as well as the Coefficient of Performance (COP) of the installation. Replacing electric heating with a heat pump	Projects have found all UK house types are suitable for heat pumps[13]. Therefore, heat pumps are widely suitable. 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,

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
	energy.	can reduce energy consumption and reduce fuel poverty.	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, which use waste heat, heat pumps or bioenergy as their energy source.	The cost of heat from a network depends upon a range of factors and can be minimised through a combination of good design practices and use of lower cost heat sources.	Heat networks can be used to reduce need for electricity network upgrades and deliver lower cost heat where the conditions allow. Heat networks are more efficient if they operate at lower temperatures and buildings with heat pumps would be suitable for heat networks if one was subsequently developed. Heat networks can be considered in areas where there is sufficient density of heat loads which are suitable for connection.
Electric Heating	Electricity to extract heat from the air or ground. Grid electricity is continuing a trend of decarbonisation through renewable energy.	While direct electric heating is more efficient than combustion boilers, including gas, they have higher electricity consumption than heat pumps. The high cost of electricity needs considered for households at risk of entering fuel poverty. Storage heaters can be used to store heat at times of lower tariffs to use at other times. This reduces electricity prices, but it means some of the heat is emitted into the property at times when it is not required.	Electric heating is technically suitable for many properties with suitable electricity connections. Operating cost needs considered when determining suitability. Hot water production is usually provided through a hot water cylinder, which requires space in a property.
Bioenergy	Sustainably sourced, bioenergy	There is uncertainty surrounding the future supply of bioenergy, and biomass boilers	The HIBS indicates that bioenergy is likely to have a limited role in the

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
	(i.e., solid biomass, biogas or biomethane) is regarded as carbon neutral.	tend to have more maintenance requirements than gas boilers.	decarbonisation of the building stock. There may be some buildings for which bioenergy can play a role, for example in hard to treat off-gas properties where heat pumps are unsuitable. Bioenergy Action Plan due to be published in late 2023. Air quality concerns need to be considered for each site.
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 legislation and Scottish legislation.	Currently hydrogen is produced in relatively small quantities, compared to natural gas 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.	Hydrogen may be appropriate in certain areas where there is local supply or where industrial demand creates economies of scale. The UK Government is establishing large-scale trials of hydrogen for heating and assessing the potential to blend hydrogen into the gas grid, with a final policy decision to be taken in 2026. Decarbonising the gas network is unlikely to deliver substantial emissions savings before the late 2020s.

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

The HIBS 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.

5.6 Indicators

The LHEES methodology sets out a core set of default indicators that are retained and outlined in Appendix F of this report. For each of the six given Considerations defined in Table 6, 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); and
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, 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. As such, this study uses these default values.

6. Policy and Strategy Context

6.1 Summary of Policy Landscape

On a UK level, there exists legally binding legislation to reach net zero emissions by 2050. The Net Zero Strategy: Build Back Greener[14] report denotes that 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 are set in place such as reaching 600,000 heat pump installations nationwide by 2028[15].

The Scottish Government has more ambitious targets than the UK Government to be net zero by 2045 with interim targets of 75% by 2030 and 90% by 2040. There are certain powers which are devolved to the Scottish Government such as promoting renewable

[14] Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk)
[15] Heat Pump Investment Roadmap (publishing.service.gov.uk)

energy and energy efficiency, while many aspects of energy policy are reserved by the UK Government.

Chapter 10 of Scotland's Heat in Buildings Strategy[16] discusses the need for the UK and Scottish Government to work alongside each other to facilitate the decarbonisation of heat.

6.2 National Policy and Strategy

A comprehensive review of UK Government and Scottish Government policy (Table 8) was carried out with particular attention paid to those that are relevant and linked to LHEES. Some key policies are listed below:

Table 8: Key National Policy and Strategy

Policy/Strategy	Description
Climate Change (Scotland) Act 2009	Sets the net zero emissions targets.
Climate Change Plan Update (CCPU)	Targets for emissions reduction by in Scotland 2032. Confirms New Build Zero Emissions from Heat Standard which will be introduced in 2024. Identifies £1.6 billion to be invested over the next parliamentary term via the Heat in Buildings Fund.
Programme for Government	Published every year at the beginning of September and sets out the actions the Scottish Government will take in the coming year and beyond.
Heat in Buildings Strategy 2021	Sets out a pathway to zero emissions buildings by 2045 and includes the New Renewable Heat Target for 2030.
Heat Networks (Scotland) Act 2021	Puts into place rules and regulations on heat networks.

[16] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)

6.3 Local Policy and Strategy, and Linkages

6.3.1 Local Strategies, Policies and Plans

Relating to the LHEES Considerations, the Council's strategies, policies and plans (Table 9) have been reviewed with specific areas of local analysis highlighted for relevance.

Table 9: Local Strategies Policies and Plans

Strategy, Policy, Plan	Description	Linkages
Council Plan 2023-28	The Climate Change strategic priority which will reducing the carbon footprint of our estate through rationalisation utilising a locality-based approach and taking a fabric first and low carbon energy generation approach to homes and buildings and developing local Low Carbon energy generation schemes and networks.	LHEES Considerations 1 to 6
Local Outcomes Improvement Plan (LOIP) 2022-28	This strategic Plan sets out what we want to achieve together as a partnership in North Ayrshire. It is a binding plan on all Community Planning partner organisations and will influence how all partners operate locally. The strategic priority of World – We will work together to reduce carbon emissions and mitigate the impacts of climate change. We will increase active travel. We will increase carbon literacy within our organisations and communities.	LHEES Considerations 1 to 6
Sustainable North Ayrshire (SNA) 2024-27	The SNA sets out the Council's journey to tackle climate change with nine strategic priorities, to be net zero by 2030.	LHEES Considerations 1 to 6. Energy Workstream is connected to the six LHEES Considerations.
Strategic Housing Investment Plan 2023-28 (SHIP)	A Strategy setting out priorities for affordable housing investment aligned with Housing to 2040.	All considerations but primary link to LHEES Consideration 5 – poor energy efficiency as a driver for fuel poverty.

Strategy, Policy, Plan	Description	Linkages
Local Housing Strategy (2023-2028)	Sets out the key housing challenges in North Ayrshire and actions required to address these challenges. The Local Housing Strategy helps to set out the local authority's approach to tackling fuel poverty, acceleration of energy efficiency improvements and uptake of low carbon heat.	All Considerations but primary link to LHEES Consideration 5 – poor energy efficiency as a driver for fuel poverty.
Local Development Plan 2 (LPD2)	The LDP2 is a 5-year land use planning strategy, with the aim to increase sustainable growth and regeneration. Includes strategic development areas and specific considerations for the six localities.	Links to LHEES Consideration 3 – heat networks. The LDP identifies potential energy sources for heat networks via the National Heat Map.
Sustainable Procurement Action Plan	Shares ideas on a local construction forum and ensure procurement is sourced with a sustainable environment goal in mind.	Links to LHEES Consideration 4 – poor building energy efficiency ensuring new and existing properties are built and maintained to high energy efficiency standards.
Regeneration Delivery Plan 2021-26	Maximises investment in the Council's Capital Programme, Ayrshire Growth Deal (AGD) and SHIP.	Primarily Consideration 6 - Mixed-tenure and mixed-use buildings, listed buildings and buildings in conservation areas.
Child Poverty Strategy 2023-26 and Child Poverty Action Plan 2022-26	Plan to reduce the levels of child poverty	All considerations but primary link to LHEES consideration 5 – poor energy efficiency as a driver for fuel poverty
Ayrshire Net Zero Accelerator	Group of business collaborating on net zero goals	Considerations 1,2,3,4 & 6

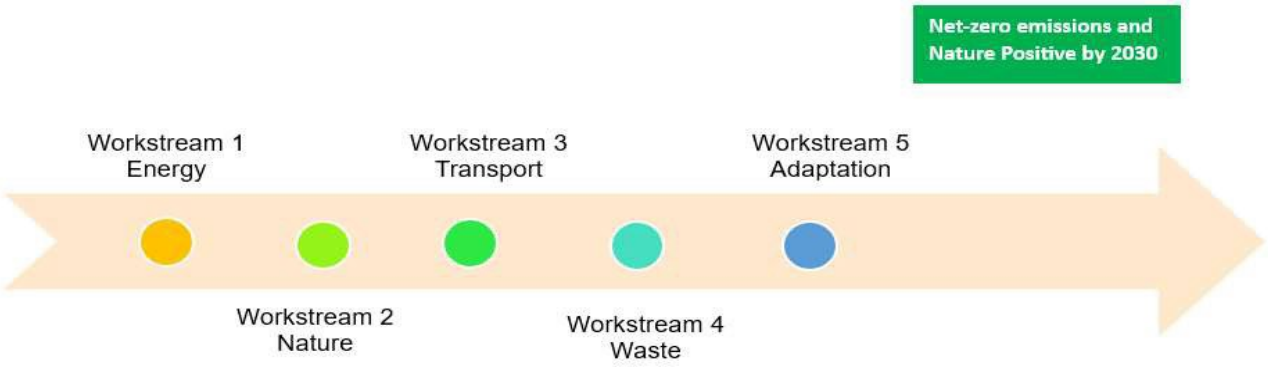
6.3.2 Summary of Ongoing Work at North Ayrshire Council

6.3.2.1 Within North Ayrshire

Sustainable North Ayrshire Strategy 2024-27 (SNA)[17] North Ayrshire Council have set out nine strategic principles to guide the Council in the next stage of their journey to net zero. Actions have been identified to support the strategic objectives and will be monitored and reported to the North Ayrshire wide Climate Change Steering Group. The Council will use the Sustainable Scotland Networks' Carbon Footprint and Project Register Tool to quantify carbon savings from actions and projects to monitor their progress and impact.

The SNA has five workstreams (Figure 6) and the Energy Workstream covers keys aspects of the LHEES, the development and implementation of which is one of the strategic principles.

Figure 6: Sustainable North Ayrshire Strategy – Workstreams



The Fuel Poverty Scotland Act 2019 sets a target of no more than 5% of households in fuel poverty by 2040 with the most recent Scottish House Condition Survey Local Authority Analysis report stated that for 2016-2018, 28% of North Ayrshire households were in fuel poverty as a result of poor energy efficiency, high fuel costs and low household income. North Ayrshire's figure is higher than the Scottish figure of 25%[18]. Although this figure is in improvement, the figures relate to data prior to the significant rise in UK energy prices in 2022.

In relation to the heat networks LHEES Consideration, one of the biggest achievements of the Affordable Warmth workstream so far has been the successful installation of heat networks at Glencairn House, Stevenston and Watt Court, Dalry, by providing renewable heat to residents. For energy efficiency considerations, North Ayrshire Council is continuing to deliver external wall insulation, top up loft and cavity wall insulation for Council homes. Through this, North Ayrshire Council is supporting numerous housing programmes, including increasing the Energy Efficiency Standard for Social Housing (EESSH) compliance rate of 98% based on 2020/21 Scottish Housing Regulator submission.

Strategic Housing Investment Plan (SHIP) 2023-28 sets out the priorities for affordable housing investment in North Ayrshire over the next five years and outlines how the Council and its partners will deliver these priorities. In the context of national policy, the SHIP is

[17] Sustainable North Ayrshire 2024-27

[18] 4 Fuel Poverty - Scottish house condition survey: 2018 key findings - gov.scot (www.gov.scot)

aligned with the long-term Housing to 2040 Strategy announced in March 2021 by the Scottish Government[19].

Locally it is an extension of and aligns with the Council's Local Housing Strategy 2018-2022 (LHS), collaborating with departments internally as well as key external stakeholders. These include the Scottish Government as well as local Registered Social Landlord (RSL) partners including ANCHO, Cairn, Cunninghame Housing Association, Link Group, Riverside Scotland and Trust Housing Association.

The SHIP ties closely with the Sustainable North Ayrshire Strategy, and in the context of LHEES the Council recognises the key role that new housing must play in carbon reduction, climate change mitigation and the alleviation of fuel poverty. To achieve these objectives the Council promotes the use of sustainable technologies and highlights the importance of project design, building materials and component parts to maximise energy efficiency and reduce running costs.

Examples so far of implementing these principles are the two completed 'Sustainable Demonstrator Homes' at Dickson Drive, Irvine which show best practice in design and innovation, ensuring energy efficiency is maximised with smart technologies, renewable energy and a 'fabric first' approach. Other housing projects tied to LHEES considerations include the biomass district heating network at Flatt Road, Largs.

The Council will also consider utilising the Vacant and Derelict Land Fund to support the regeneration of SHIP sites where they are strategically aligned with the Council's Regeneration Delivery Plan.

Local Development Plan (LPD2) A vision for the local authority area with specific policies covering four key visions of the plan to become sustainable and successful, resilient, connected and low carbon. This is similar to the LHEES in taking a specific place-based approach with the same six geographical locality areas within the local authority boundary.

Local Housing Strategy The updated Strategy was released this year covering the period 2023 to 2028. This was developed through a process of research and consultation, with one example contributing to the last period; Fuel Poverty and Climate Change which closely links to the LHEES and local area energy planning outcomes. The Local Housing Strategy details the issues and challenges facing the local housing system and describes how they will be addressed with five key themes of supply, condition, place, support and homelessness identified.

Notably for North Ayrshire, the Local Housing Strategy, and the Housing Need and Demand Assessment on which it is based, identifies five sub-housing market areas which generally align with the six localities except for Irvine and Kilwinning which are merged into a single sub-housing market area due to their close proximity.

The Draft Child Poverty Strategy 2023-26, Child Poverty Action Plan 2022-26 and Report 2022-23 recognises that the instances of child poverty within North Ayrshire is one of the highest in Scotland. Research carried out by housing charity Shelter, the Council have committed to ensure that all newly built Council properties have study space and private gardens to promote wellbeing. The Council also recognises the link between attractive, warmer and better ventilated homes in relation to improved cognitive development in

[19] Housing to 2040 - gov.scot (www.gov.scot)

children, therefore ensuring these objectives are aligned with creation of new affordable social homes.

Policy for Community Benefits from Renewable Energy Deployment aims to increase the amount of renewable energy generated in North Ayrshire by promoting developments in line with the national rate and providing community benefits of not less than £5,000 per installed MW per year.

Sustainable Procurement Action Plan The Council advertises all tenders through the Public Contracts in Scotland website. Within the Plan is a commitment to ensure opportunities are open to all local businesses and Small and Medium Enterprises (SMEs), who are subsequently not disadvantaged during the tender process. The Plan additionally seeks to develop a local construction forum to share ideas and ensure that the key factors of delivery of the LHEES Considerations relating to heat decarbonisation and energy efficiency in the built environment are well understood.

Regeneration Delivery Plan 2021-26 aligns with the Energy, Nature and Transport Workstreams within the Sustainable North Ayrshire Strategy. For LHEES, the Regeneration Delivery Plan assists in meeting the socio-economic duty set out in the Fairer Scotland Duty by maximising the impact of investment being made via the Council's Capital Programme, Ayrshire Growth Deal and the Strategic Housing Investment Programme.

Energy Efficient Scotland: Area Based Scheme (ABS) – In addition to a wide range of sustainable strategies covering the construction and maintenance of North Ayrshire Council's buildings and estate and working with Registered Social Landlords, funding has also been secured to enhance energy efficiency of eligible privately owned properties within North Ayrshire. Working with the Council's contractor and the Scottish Government's Home Energy Scotland, the Council announced in May 2023 that they are engaging with private homeowners who have low incomes and are recognised as being vulnerable to the cold. North Ayrshire Council will assist in implementing energy efficiency measures such as external wall insulation and solar PV with Council procured Area Based Scheme (ABS) contractors. This builds on the ABS work undertaken by North Ayrshire Council since 2013.

ECO4 Flexible Eligibility is a nationwide obligation on energy suppliers aimed at helping households to cut energy bills and reduce carbon emissions with the help of energy saving measures. The Council have issued a Statement of Intent, welcoming the scheme's plan to improve the homes of those in fuel poverty and vulnerable to living in cold homes.

To ensure the successful implementation of improvements, the Council only accepts applications from approved installers including local suppliers.

6.3.2.2 Regional Level

The Ayrshire Regional Economic Strategy[20] is a collaboration of nine organisations, including North, East and South Ayrshire Councils, to promote a collective approach to Community Wealth Building (CWB). It aims to strengthen local supply chains and explore alternative use of land and assets within the Community Wealth Building Commission.

In relation to LHEES, North Ayrshire Council has approved construction of solar PV farms at two former landfill sites, Shewalton and Nethermains, to generate almost two-thirds of the Council's energy needs, reduce CO_2 emissions and helping the Council progress its

[20] Ayrshire Regional Economic Strategy (north-ayrshire.gov.uk)

commitment of net zero emissions by 2030. Furthermore, the document highlights the LHEES related challenge of the lack of availability and unaffordability of housing on Arran where a high percentage of properties are shown to have poor energy efficiency ratings.

The Strategy also outlines the importance of a strong natural and built environment and highlights 432 areas of vacant derelict land across Ayrshire. The regeneration of these will be closely aligned with the strategic goals and successful delivery of the LHEES.

7. Baselining

7.1 Baseline Summary Across North Ayrshire

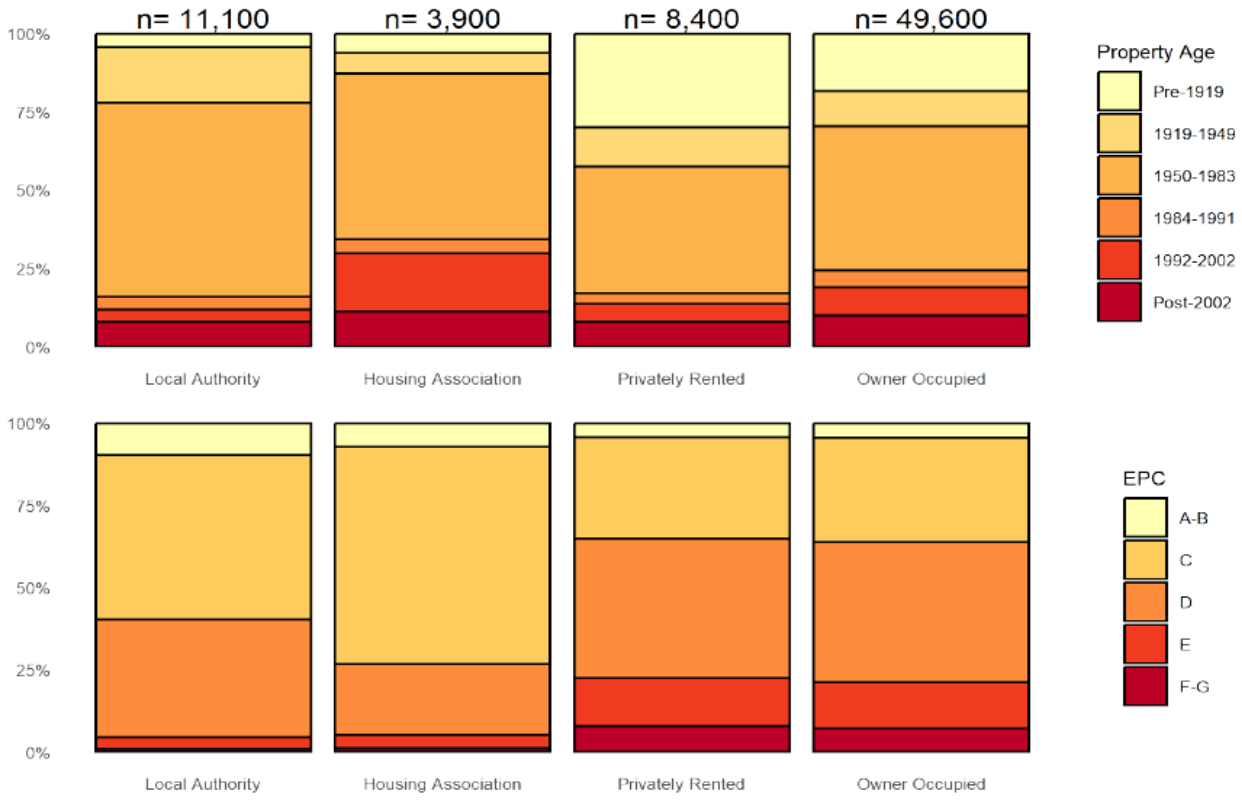
7.1.1 Domestic Building Stock

The Home Analytics dataset records 73,627 domestic properties in North Ayrshire. After property records with incomplete data or erroneous values were excluded, around 73,000 properties were included in the baseline analysis, with approximately 11,100 being in the ownership of North Ayrshire Council and a further around 3,900 owned by housing associations. Private landlords hold around 8,400 properties, with the remainder, approximately 49,600, being owner-occupied. There are conservation areas in North Ayrshire and around 3,800 domestic properties are situated in those. Listed buildings make up just 1% of the domestic building stock, with North Ayrshire Council owning just under 100.

The majority of the domestic building stock in North Ayrshire was constructed after 1950 (Figure 8), with 84% of North Ayrshire Council's stock built before 1983. By contrast, the housing association stock has a larger proportion of newer builds, and this is ultimately reflected in the greater proportion of housing association properties reaching an EPC grade of C or better. Within North Ayrshire Council's stock, 40% of properties require an intervention of some sort to bring their EPCs up to C or better.

The private sector has a challenge to improve EPCs both proportionally and in absolute numbers of properties. According to EPC records, across Scotland around, 50% of properties have an EPC rating of C or better, so Council-owned properties perform better but private homes in North Ayrshire are poorer. Again, EPC records reveal that around 19% of Scottish homes were constructed before 1919 but the private rented sector in North Ayrshire exceeds this (with 30%, Figure 8) and this may contribute to the poorer energy efficiency.

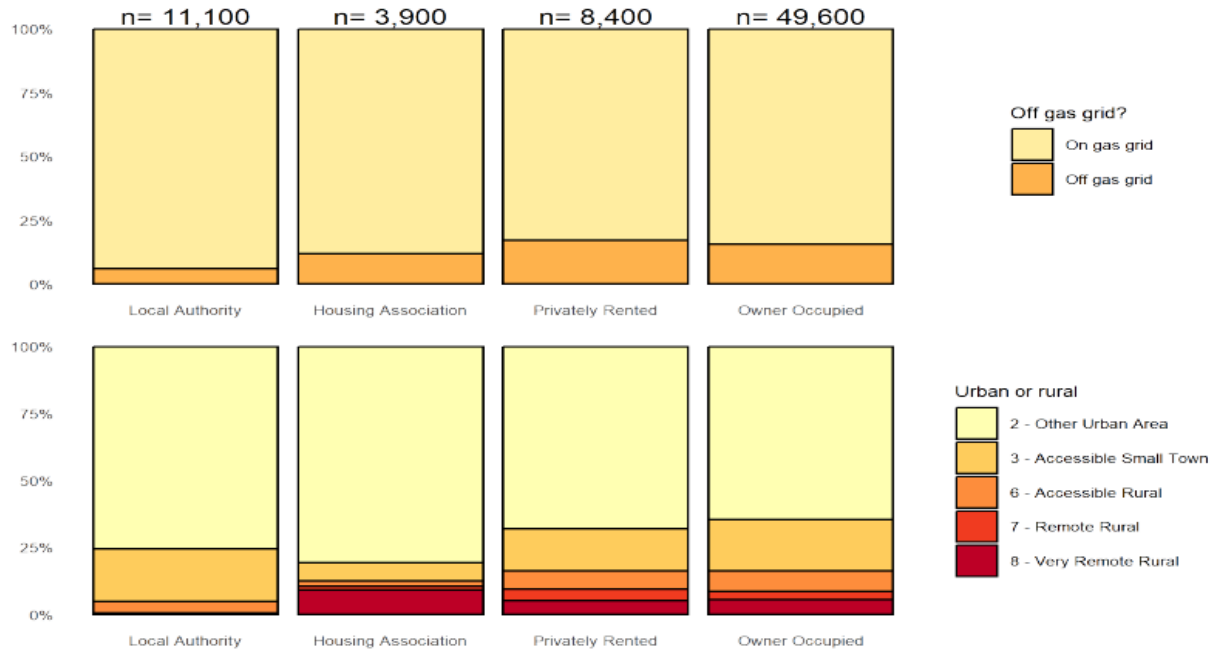
Figure 7: Domestic Buildings – Distributions of Age and EPC rating by Tenure Type



Note, for clarity, counts rounded to nearest hundred

Figure 9 describes the number of properties which are on or off the gas grid and the distribution of properties between urban and rural spaces.

Figure 8: Domestic Buildings – Distributions of Gas Grid Connectivity by Tenure Type



Note, for clarity, counts rounded to nearest hundred

Comparing the Home Analytics dataset to Council Tax information from March 2023, shows the total number of properties is comparable as there is 70,662 dwellings on Council Tax information. However, when looking at the breakdown by tenancy, it is less accurate as Council Tax has the following number of properties per tenancy category: 13,738 LA; 42,826 owner-occupied; 8,727 private landlords; and 5,371 in housing associations. There is a substantive difference in tenancy category of the Home Analytics dataset. However, it was not possible to reconcile the two datasets due to differences in the data fields. This Strategy also utilises data from the One Scotland Gazetteer, which, again, holds a different total number of properties and, consequently, the reported total number of properties in the Strategy may vary depending on the analysis method being reported.

Other aspects of the data could not be verified independently from other sources and there remains a risk that the data is incorrect in ways which cannot be foreseen at this stage.

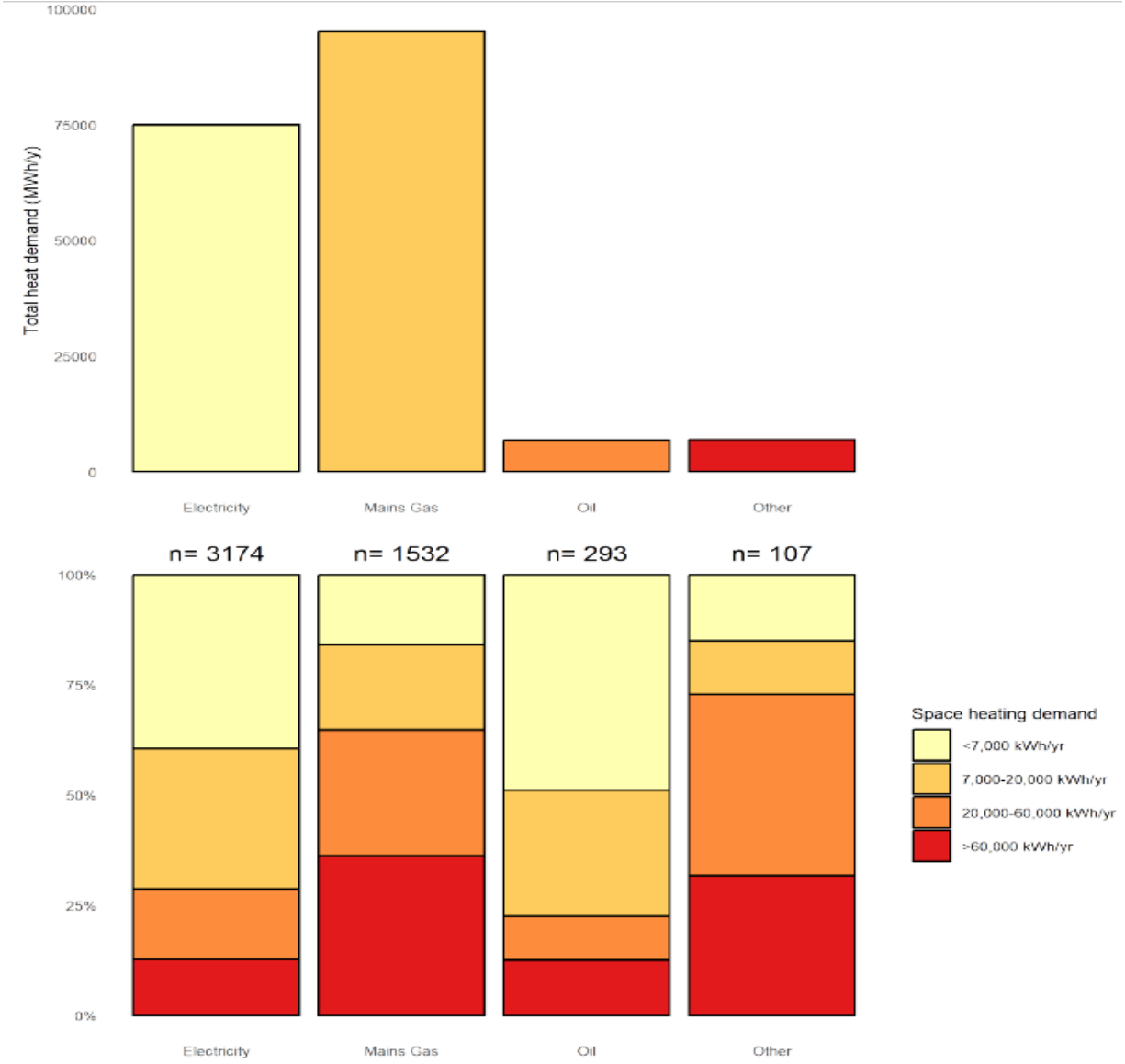
7.1.2 Non-Domestic Building Stock

The Non-Domestic Baseline Tool utilises data derived from Non-Domestic Analytics and some discrepancies in that dataset are noted. These are explained by the fact that the details of some properties are imputed from a few measured parameters. For example, the floor area of a building could have been estimated from its measured footprint on a map and an estimated number of levels based on its measured 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, and so analytical results should be read with caution. Nevertheless, the data has been used for the baselining step of the LHEES process to get a flavour of the building stock.

The Non-Domestic Baseline Tool records 5,106 non-domestic buildings in North Ayrshire. Together, these have an estimated total heat demand of 184,195 MWh/y. It is worth noting that the Scotland Heat Map data includes 4,445 properties and it is that data which is used for heat network analysis in this report. The discrepancy is likely to be due to multiple Unique Property Reference Numbers (UPRNs) being applied to the same building in the Baseline Tool. North Ayrshire Council data shows that the Council own 630 non-domestic properties of which 131 use gas, 4 use oil, 20 use biomass, 1 uses LPG for heating, with the remainder using electricity.

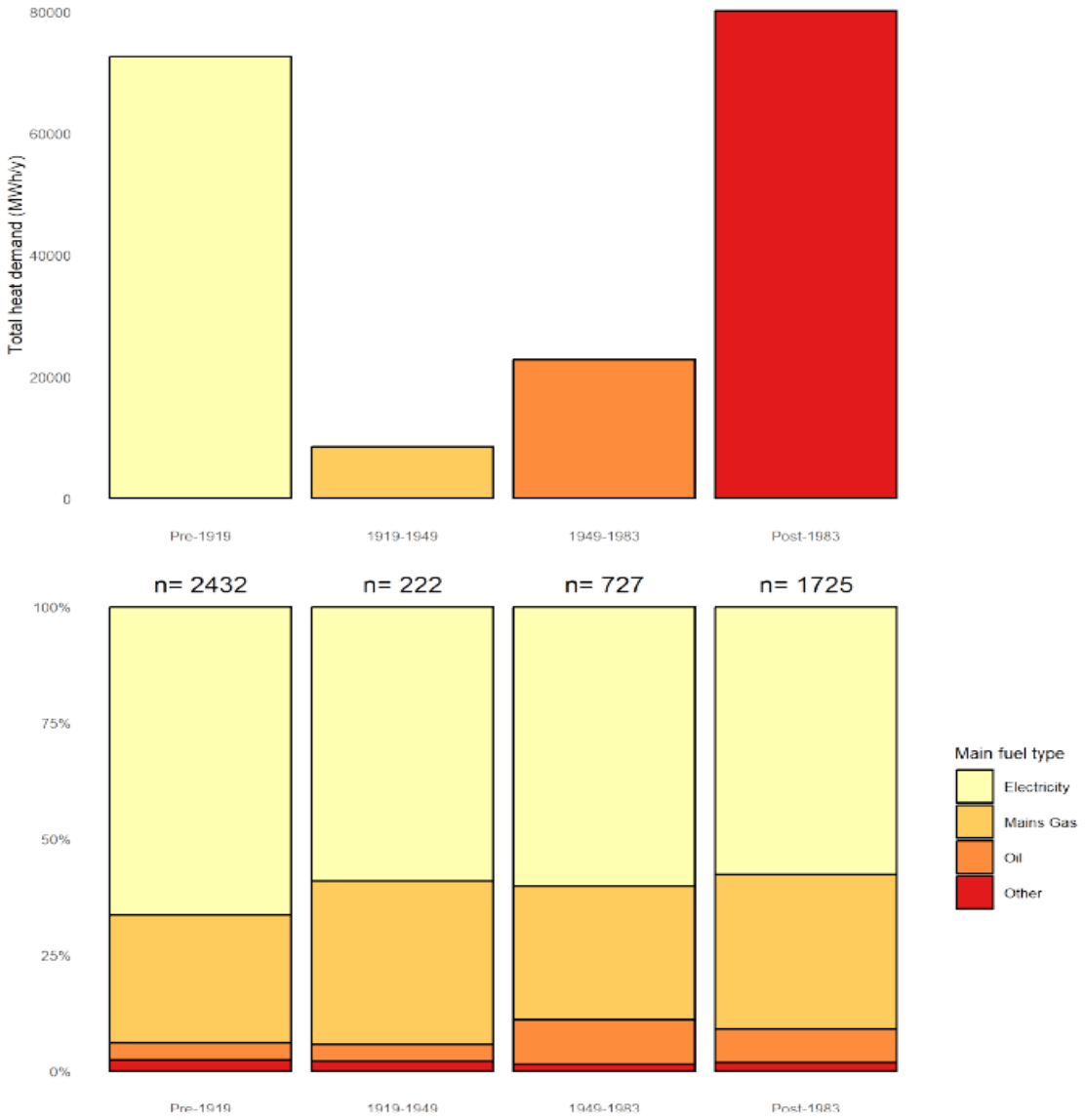
Figure 9 shows the aggregated heat demand for different energy sources. Gas is the biggest source of heat, but electricity and oil have the largest share of small heat loads.

Figure 9: Non-domestic Heat Demand by Energy Source and Demand Category



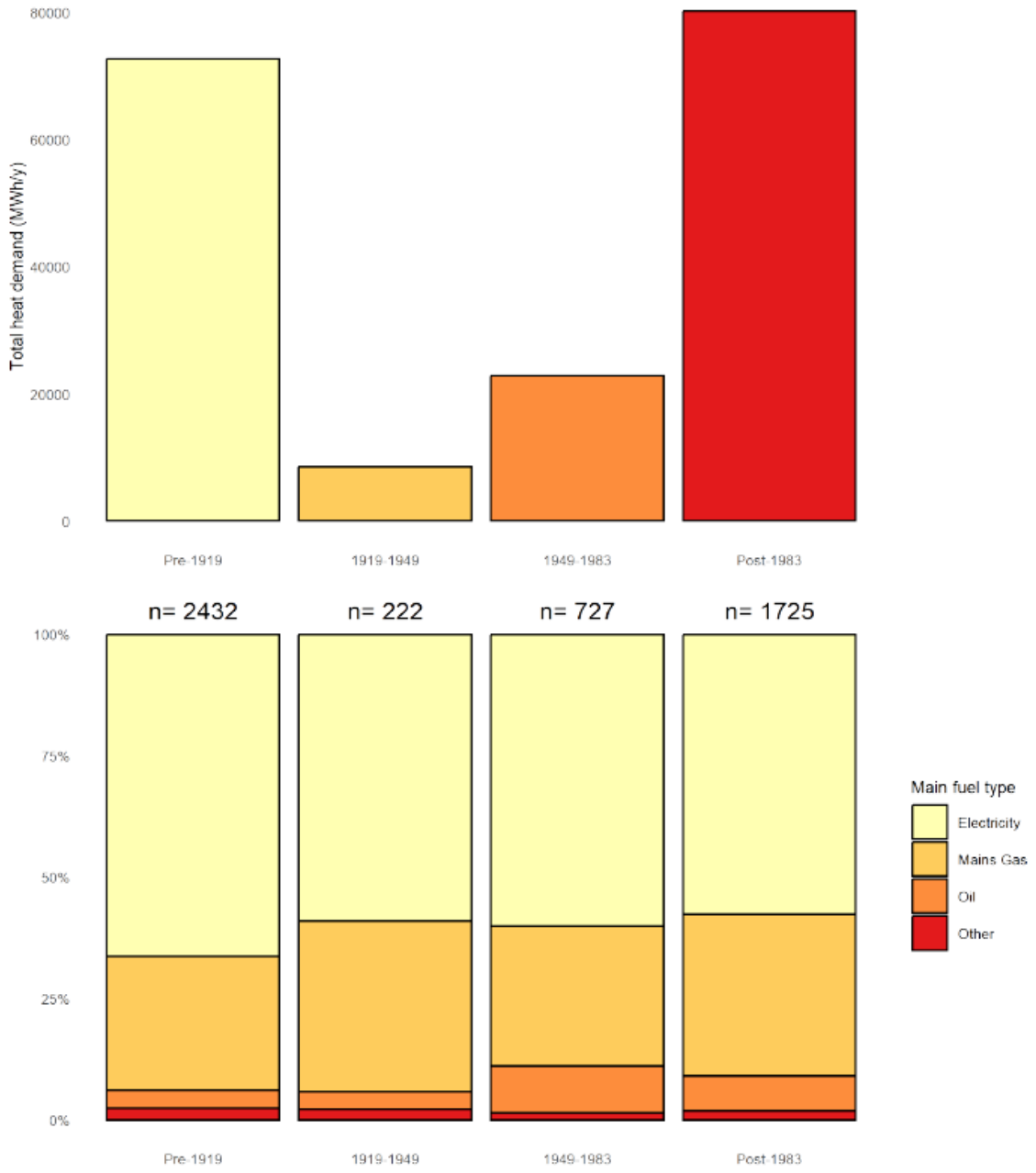
Smaller buildings account for half of the total heat demand (Figure 10). It is likely that many of the small properties utilising electricity are already using heat pumps for heating and cooling.

Figure 10: Non-domestic Heat Demand by Energy Source and Floor Area Category



The pattern of building age (Figure 11) shows a large proportion of pre-1919 buildings with a high heat demand and this group of properties may be a target for energy efficiency measures.

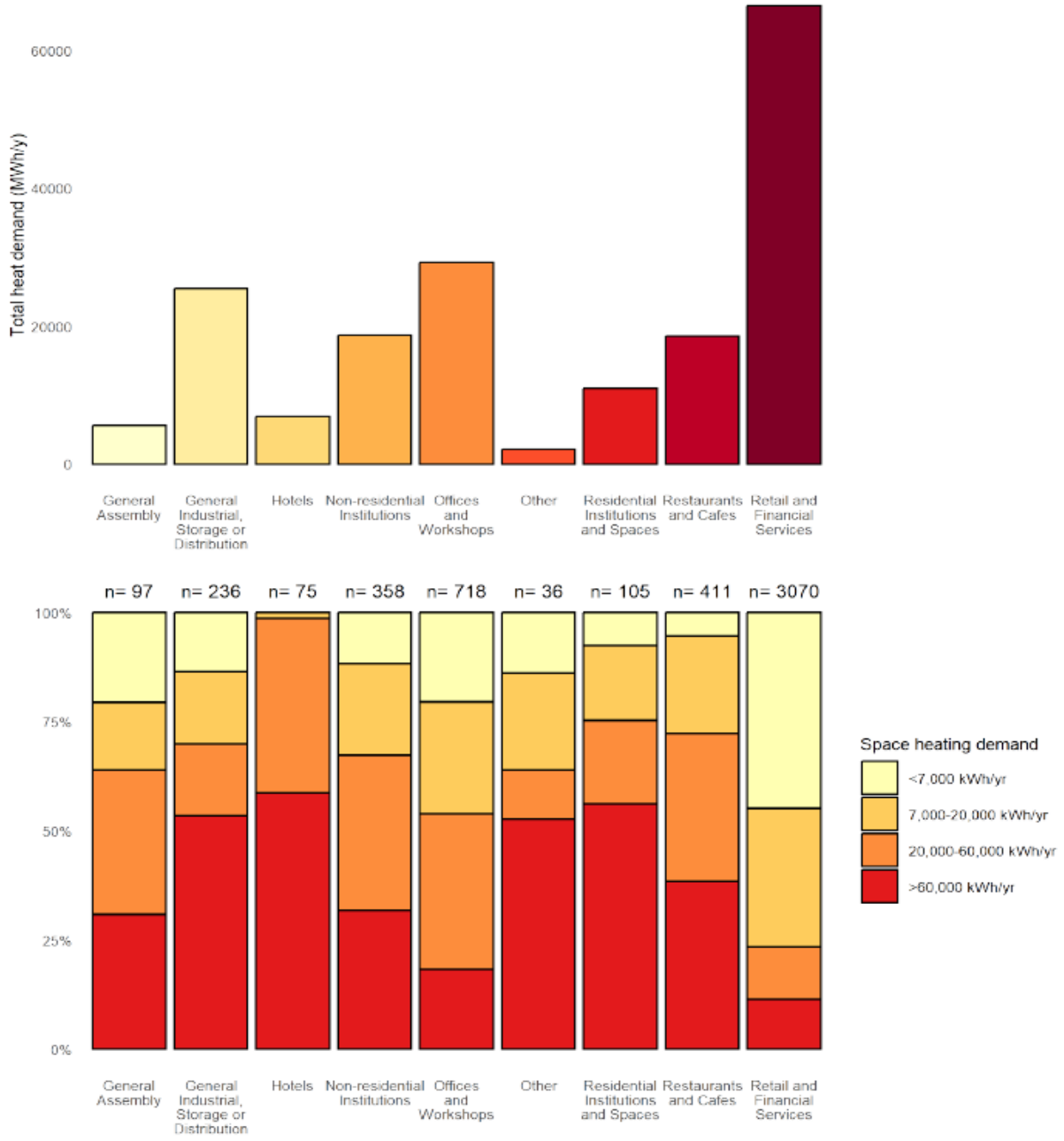
Figure 11: Non-domestic Heat Demand by Energy Source and Building Age Category



Note, for clarity, percentages rounded to nearest integer

Figure 12 highlights the predominance of “Retail and Finance” as a non-domestic property and usage in North Ayrshire.

Figure 12: Non-domestic Properties by Type and Heat Demand



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

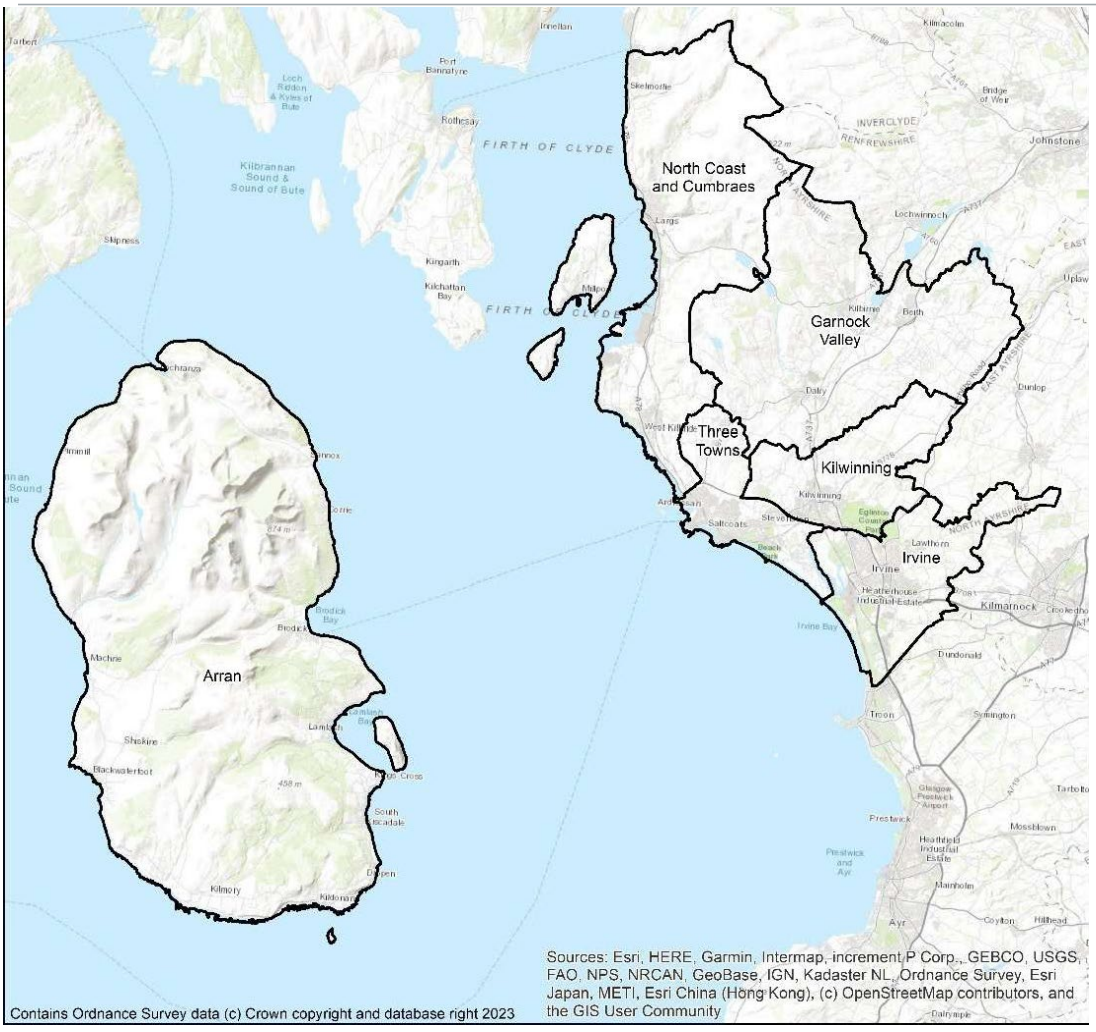
8.1 Purpose

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

8.2 Strategic Zones

Upon analysing the results of analysis conducted using the LHEES methodology based on intermediate zones, engaging with stakeholders from within the Council on how actions would be taken forward and having conducted analysis of the areas which may be suitable for heat networks, the locality boundaries were decided upon as the most suitable zoning for North Ayrshire (Figure 13). This is because these boundaries capture some fundamental geographical differences and by using existing policy boundaries it allows an alignment with other North Ayrshire Council services and areas of policy. The analysis on intermediate zones is included in Appendix A for reference.

Figure 13: Map of North Ayrshire Localities to be Used as Strategic Zones



8.3 Domestic Properties and Tenure

The numbers of domestic properties, broken down by strategic zone and tenure are given in Table 10.

Clear differences are observed, such as fewer Council properties in Arran and North Coast and the Cumbraes than the other localities. As such, when considering delivery actions, the varying nature of the tenure will be important to considering which stakeholders need engaged with and the most appropriate approach. Section 9 provides actions broken down by tenure which would allow a tailored approach to delivery within each locality.

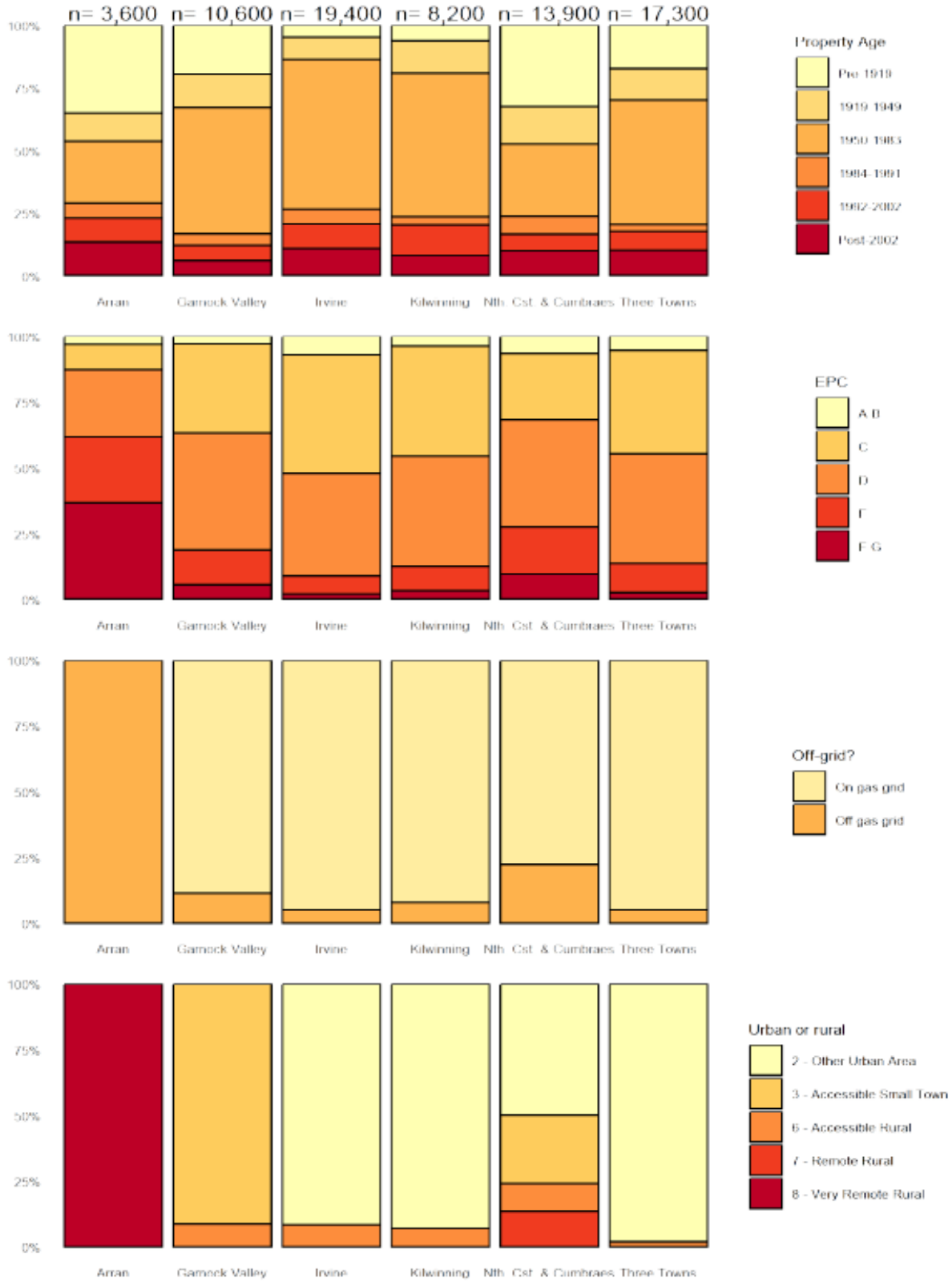
Table 10: Domestic Properties in the Strategic Zones

Strategic Zone properties	Total domestic properties	Council owned	Housing Association	Private Rental	Owner Occupier	Unknown Tenure	Properties in buildings with multiple tenures
Arran	3,778	65	371	470	2,825	47	2%
Garnock Valley	10,650	2,006	246	1,052	7,283	63	10%
Irvine	19,533	3,318	1,378	2,090	12,663	84	12%
Kilwinning	8,239	1,363	686	670	5,494	26	8%
North Coast and Cumbraes	14,044	745	176	1,979	11,080	64	22%
Three Towns	17,383	3,674	1,038	2,230	10,376	65	20%

The data also shows that the Mixed Tenure buildings are more common in Three Towns area as well as the North Coast and Cumbraes with a significant, but lower, number in Irvine and Garnock Valley. Implementing insulation measures is likely to be more challenging in these buildings and a local approach to building relationships with owners is likely to be required. Engagement at local levels may also highlight further differences between communities with different barriers to be overcome.

A baseline assessment of these properties by area, like that in Section 7.1, is shown in Figure 14. This Figure provides information on the age of the property, EPC rating, if the property is on or off the gas grid and if the locality is rural or urban.

Figure 14: Baselining of Domestic Properties in the Strategic Zones



Note, for clarity, counts rounded to nearest hundred

8.4 Energy Efficiency and Other Outcomes

The Home Analytics tool was used to calculate a weighted energy efficiency score. The tool estimates 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. The Weighted Scores for energy efficiency is shown in Table 11 and these are illustrated in Figure 15, which indicates the tenure of the properties which require interventions.

Table 11: Domestic Energy Efficiency – Number of Properties, Percentage of Properties Requiring and Intervention and Weighted Scores by Strategic Zone

Strategic Zone	Loft Insulation	Glazing Upgrade	Wall Insulation	All	Loft Insulation (%)	Glazing Upgrade (%)	Wall Insulation (%)	All (%)	Total Weighted Score
Arran	748	319	2,308	3,375	21%	9%	64%	31%	21
Garnock Valley	1,003	1,332	5,122	7,457	9%	13%	48%	23%	9
Irvine	1,199	1,585	6,592	9,376	6%	8%	34%	16%	6
Kilwinning	702	532	3,014	4,248	9%	6%	37%	17%	9
North Coast and Cumbraes	1,568	876	8,232	10,676	11%	6%	59%	25%	11
Three Towns	1,447	1,540	6,824	9,811	8%	9%	39%	19%	8
Total	**6,667**	**6,184**	**32,092**	**44,943**					

Figure 15: Domestic Properties Requiring Upgrades to Glazing and Loft and Wall Insulation

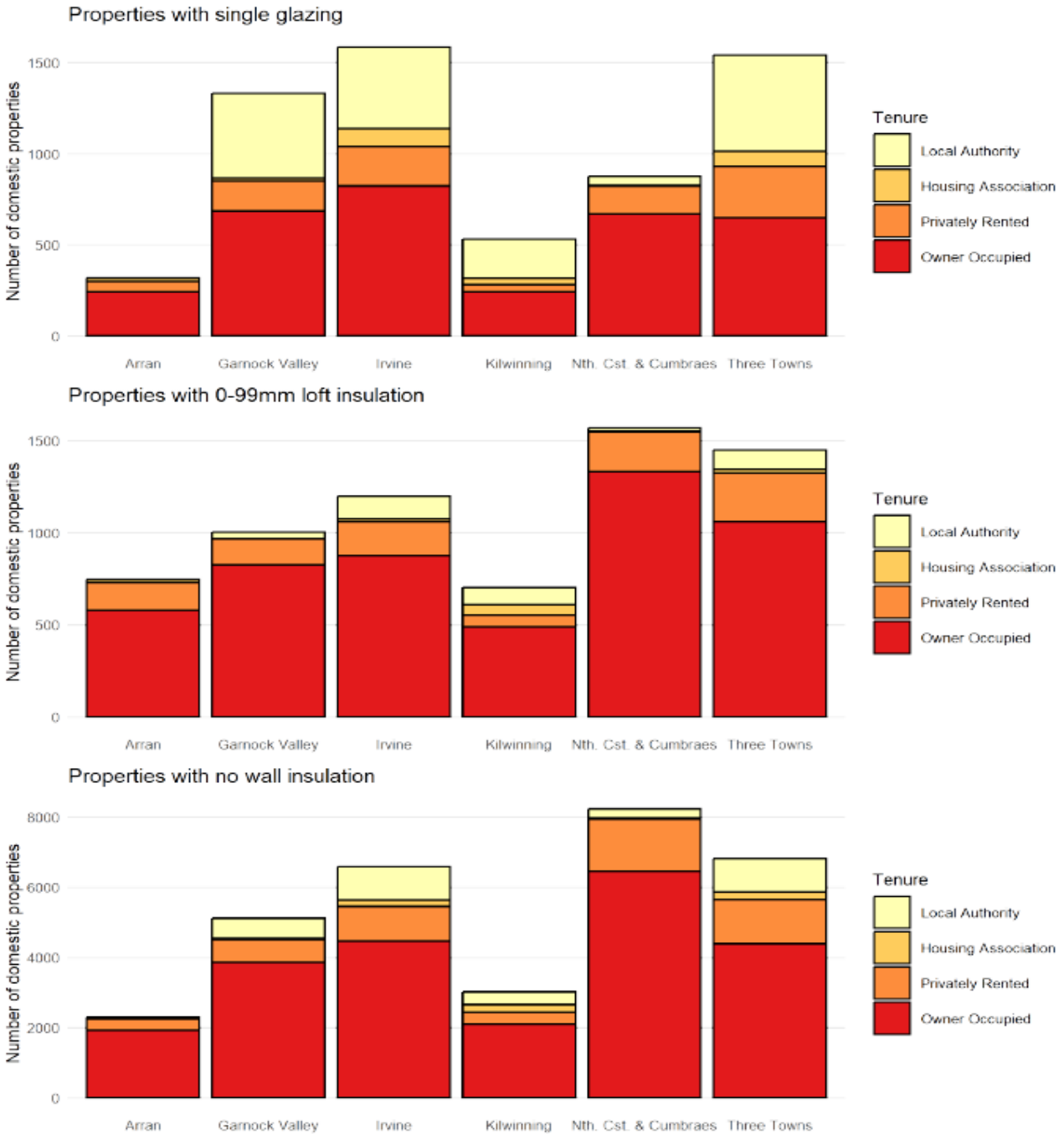


Table 12 shows the breakdown of the effect the energy efficiency interventions have on reducing energy demand across all the North Ayrshire building stock. For reference the baseline heat demand per year for the domestic buildings in North Ayrshire is estimated to be 987,000 MWh, according to Home Analytics. 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 upgrades are by far the most cost-effective method to reduce heating demands and have the potential to save significant energy.

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, there may be other reasons for doing less cost-effective measures, such as funding streams being allocated only to specific measures, improving the aesthetics of the building with external wall insulation or window upgrades, or households being at higher risk of fuel poverty.

Table 12: Summary of Energy Efficiency Interventions Across all Buildings in North Ayrshire

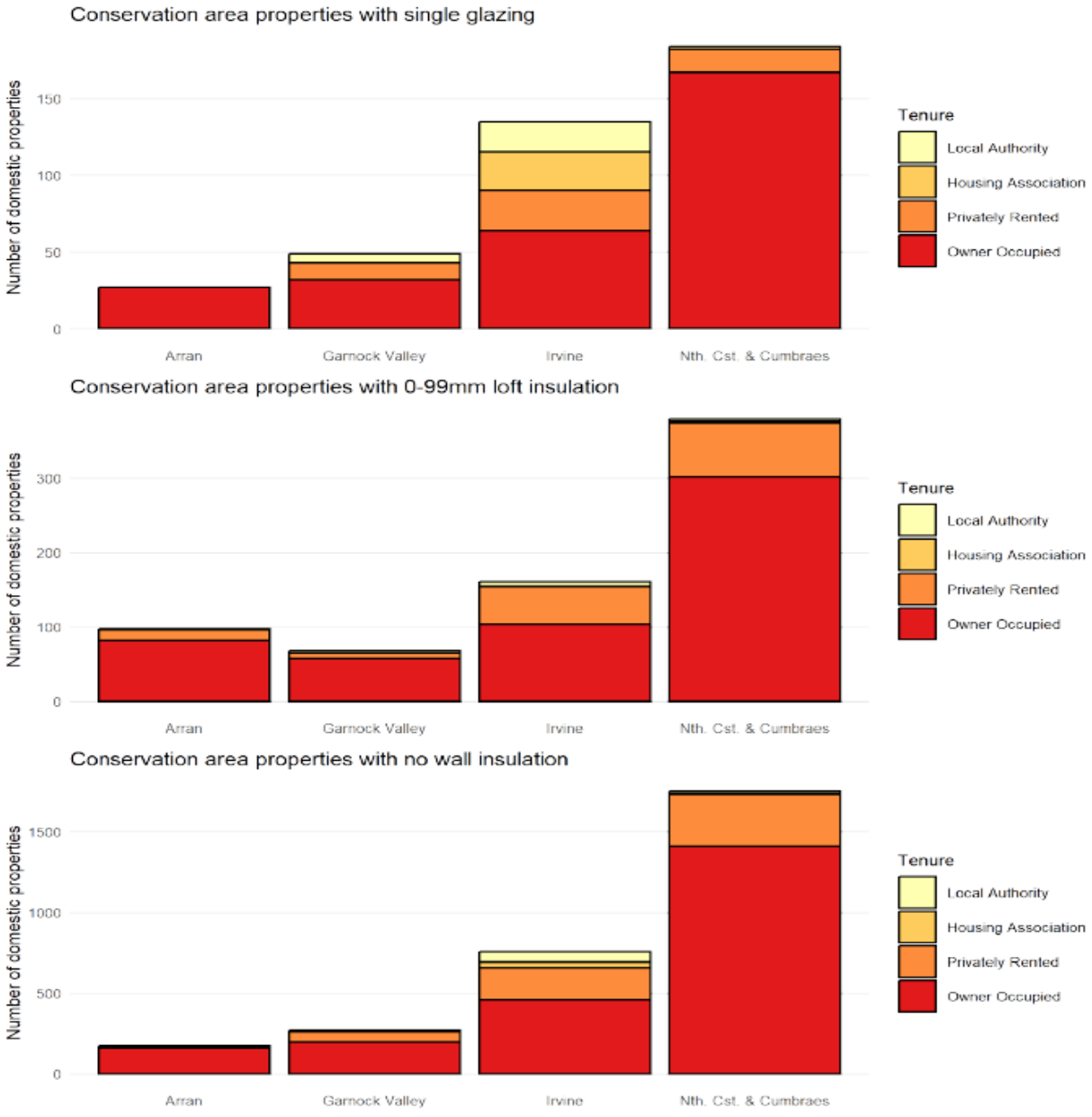
Measure	Heat Demand Reduction	Ratio of Fuel Cost Savings (kWh/y) Per investment Cost (£/£)
Cavity Wall Insulation (CWI)	55,800,000	0.206
Internal Wall Insulation (IWI)	8,600,000	0.111
External Wall Insulation (EWI) (only wall measure)	32,300,000	0.091
External Wall Insulation (alongside CWI or IWI)	98,900,000	0.022
All wall insulation measures	**195,500,000**	**0.039**
Loft insulation upgrade from <100mm	27,700,000	0.927
Loft insulation upgrade from 100-250mm	46,000,000	0.475
Loft insulation upgrade from 250-300mm	30,100,000	0.193
All loft insulation measures	**103,900,000**	**0.377**
All Single to Double Glazing upgrade	**8,700,000**	**0.048**
Cylinder insulation upgrade from <50mm	17,700,000	0.219
Cylinder insulation upgrade from 50- 80mm	2,900,000	0.115
All cylinder insulation measures	**20,600,000**	**0.193**
All Combined Measures	**430,300,300**	**0.060**

8.5 Mixed Tenure, Mixed Use and Historic

Installing insulation measures on properties in conservation areas or listed properties is more challenging, can cost more and may take more time than other buildings. The cost and time to insulate the walls of these properties or the need for additional permissions can make them either less likely to be undertaken or carried out less quickly than in other areas. Figure 16 shows the distribution of properties across North Ayrshire in conservation areas, where implementing measures is expected to be more challenging.

There are more buildings in conservation areas in the North Coast and Cumbraes, than other areas and the majority are owner occupied.

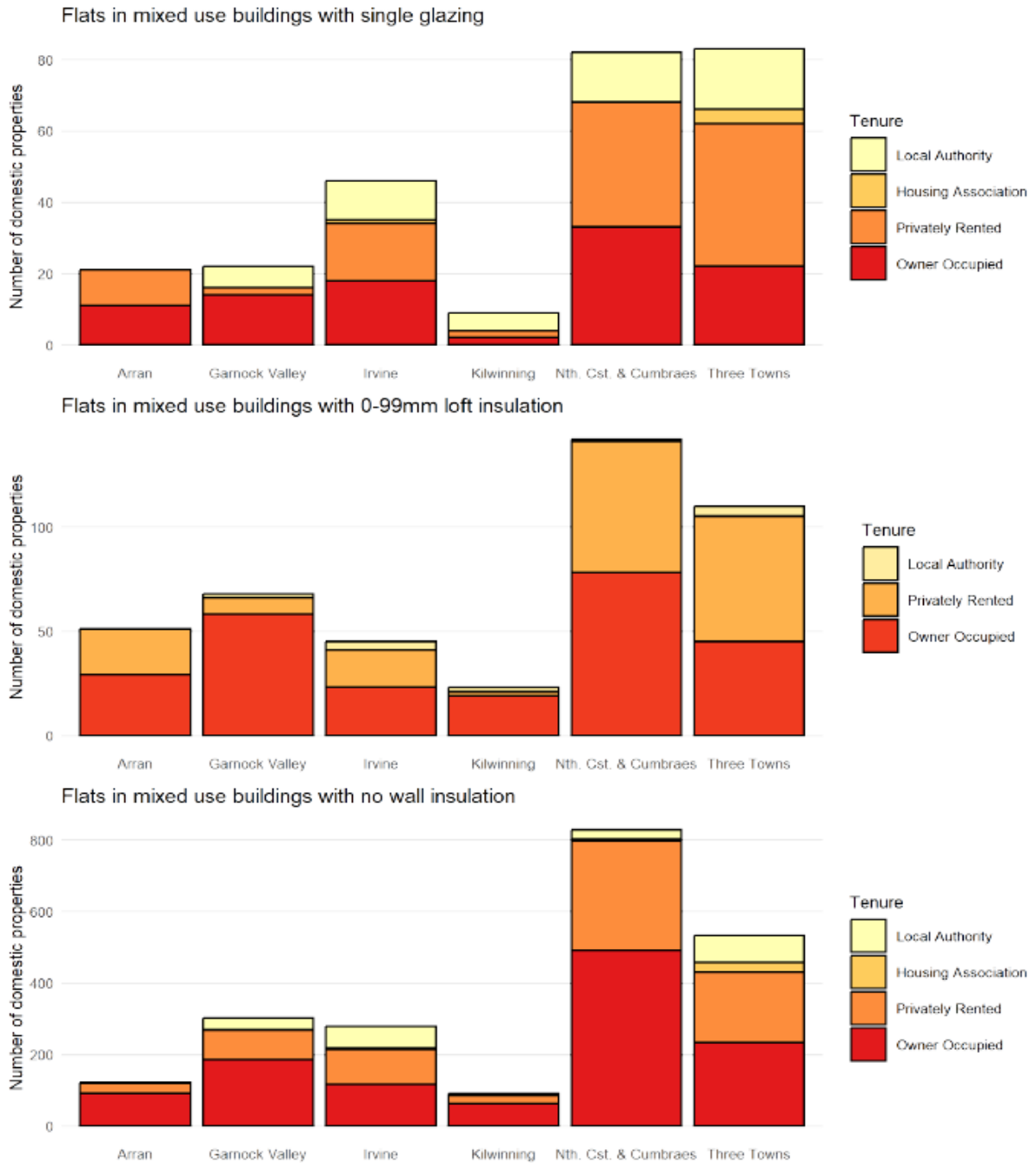
Figure 16: Energy Efficiency Interventions in Properties Within Conservation Areas



Flats that are in mixed use buildings can be challenging to upgrade, due to multiple stakeholders with different priorities. The large number of uninsulated walls in these buildings across the Council area will require specific consideration. There are more of these buildings in the North Coast and Cumbraes and the Three Towns areas. Privately rented and owner-occupied tenures are the dominant category for mixed use buildings.

Figure 17 shows that there are very few local authority or housing association properties that are without wall insulation.

Figure 17: Energy Efficiency Interventions in Flats in Mixed Use Buildings



8.6 Domestic Energy Efficiency and Fuel Poverty

The Weighted Scores for fuel poverty as a result of poor energy efficiency for the strategic zones, using the default weightings, have been calculated in Table 13.

Arran stands out as a zone where fuel poverty is significantly aggravated by poor energy efficiency. Two thirds of the building stock is identified as requiring wall insulation. It should be noted that 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 be misleading. Although, the owner occupiers of Arran represent a group which may benefit from help, advice, funding, or communal procurement of wall insulation interventions, other local parameters need to be considered (such as holiday homes) to prioritise actions. This is considered in Section 9.

Table 13: Domestic Fuel Poverty Scores by Strategic Zone

Strategic Zone	Households with energy bills > 10% of income after housing costs	Households with energy bills > 20% of income after housing costs	Total Weighted Score
Arran	41%*	47%*	36
Garnock Valley	29%	9%	26
Irvine	27%	8%	21
Kilwinning	25%	7%	21
North Coast and Cumbraes	26%	12%	26
Three Towns	28%	10%	23

*The Home Analytics data shows Arran as having more households in extreme fuel poverty than in fuel poverty. This appears to be a data anomaly.

8.7 Heat Network Zoning

8.7.1 Approach

The principal determining factors for the feasibility of heat networks are the heat density in an area and the presence of one or more “anchor loads” i.e., loads which are large, stable and likely to connect. The initial stage of investigating heat networks is to analyse the density of the heat demands across North Ayrshire.

North Ayrshire has a number of large towns as well as some rural areas but there are no large urban areas [21]. As such the potential heat network areas are highly dependent upon key anchor loads rather than large areas of high demand density.

The Scottish Heat Map data was supplemented with data on the fuel consumption of Council buildings and data validation was undertaken. The purpose of this was to ensure that areas identified had as high a chance of being developed.

The maps presented illustrate the heat demand density of buildings and highlight the possible anchor loads with the addition of other data including local authority-owned

[21] Scottish Government Urban Rural Classification 2020 - gov.scot (www.gov.scot)

properties, potential sources of heat and areas of future development. A more complete list of maps is found in Appendix D which also considers combined heat demand density as a scenario for each location.

Where areas were shown to be viable, additional checks were carried out on the anchor heat loads and any loads considered erroneous were removed from the analysis. This included multiple industrial buildings where the heat required for space heating had been estimated in the Scottish Heat Map to be very high, but the data was low confidence, as well as a number of instances of heat demands being double counted.

The purpose of this data cleaning is to maximise the likelihood that areas identified in this analysis would make viable heat networks.

Further validation of both the actual heat demands of the buildings and their suitability for connection to heat networks would be important before deciding on future heat network areas.

The linear heat density method was used, which involves drawing a circle around each building the diameter of which is proportional to the heat load of the property. Two measures of heat network viability were used and are represented here:

- A baseline scenario using 4,000 kWh/m/year where the circle around each property (in kWh) is divided by 4,000 to give a radius in metres around the property (shown in magenta in Figure 18); and
- A more stringent scenario using 8,000 kWh/m/year where the radius of the circle is the heat load in kWh divided by 8,000 (shown in green in Figure 18).

The 4,000 kWh/m/year measure highlights more areas as being potentially suitable and the 8,000 kWh/m/year shows fewer areas, but those areas have a higher chance of forming a successful heat network.

Measures of more than 8,000 kWh/m/year were not considered due to a lack of areas with suitable heat density, which is consistent with North Ayrshire not having any very urban areas. There were no areas identified using 16,000 kWh/m/year or higher.

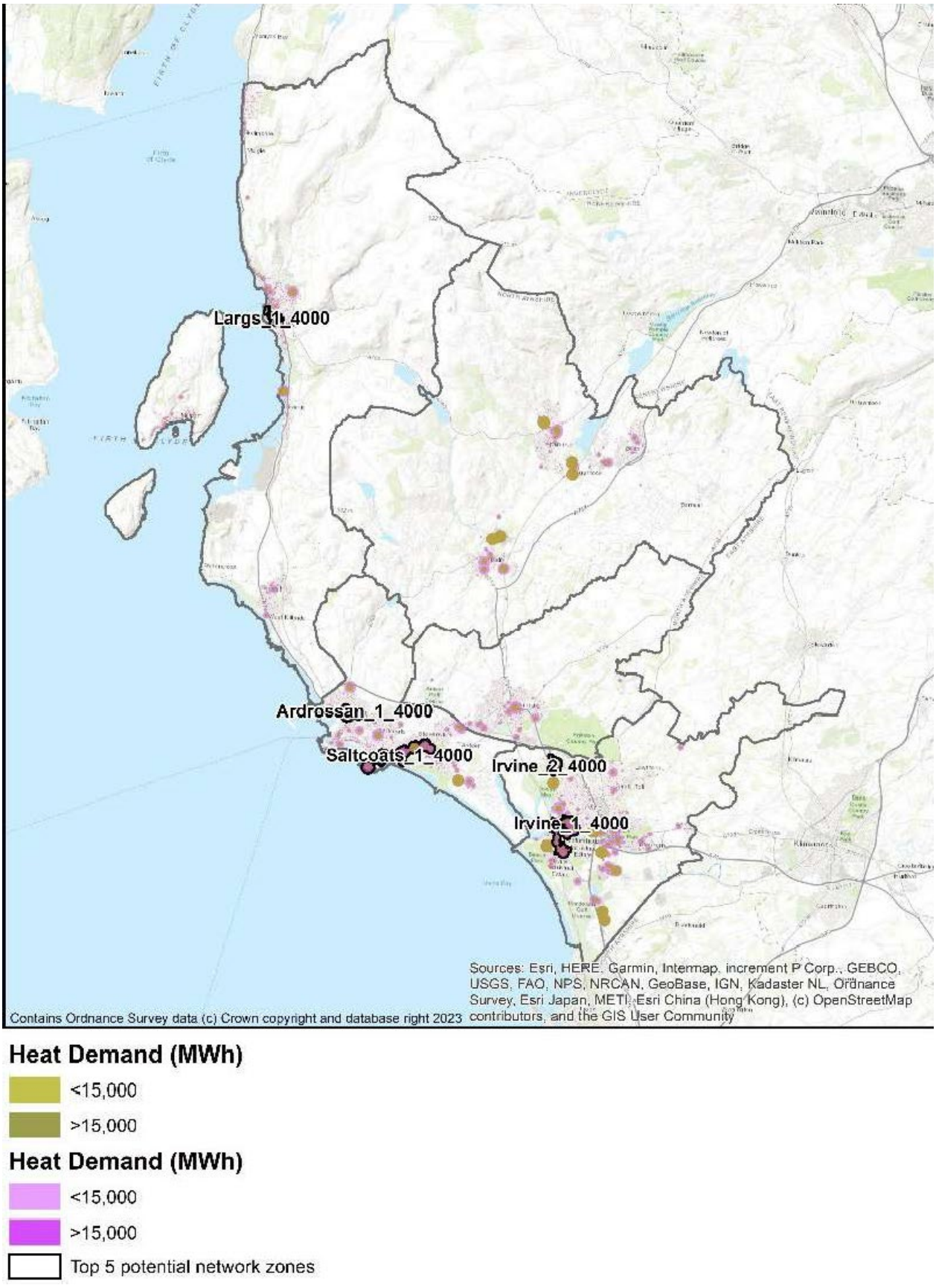
Finally, areas were identified where the overlapping circles around each point, (proportional to the size of each heat load) formed a continuous area with heat loads totalling 15,000 MWh/year or more.

This heat load represents a 3 MW heat source operating for 5,000 full load equivalent hours. The purpose is to identify those areas where it is likely that there is a sufficient heat load to warrant a new energy centre being constructed. This is intended only as a guide and the exact cost of each energy centre and network would need to be calculated at feasibility stage.

8.7.2 North Ayrshire Council Overview

An analysis of the potential for heat network zones identified areas where heat network zones may a viable method of delivering low carbon, low-cost heat to homes and businesses. There are different levels of potential viability. The areas considered are shown in Figure 18. The 4,000 kWh/m/year (baseline) reference is used to identify areas with the 8,000 kWh/m/year (stringent) areas highlighted where they are present to convey a greater confidence that a heat network is likely to be feasible.

Figure 18: North Ayrshire Overview of Potential Heat Network Zones



The zones highlighted in Figure 18, include 3.5% of the domestic and 12.8% of the non-domestic properties in North Ayrshire. The collective heat demand of the non-domestic properties which could connect to potential networks is over 20% of the total non-domestic demand. However as stated previously there is some uncertainty about the magnitude and location of non-domestic heat demands as well as around the fuel they currently use. Future new-build developments may lend themselves well to heat networks as the installation cost and disruption of heat networks is lower if completed at the time of building construction, so the numbers could increase in the future.

There are currently 13 small existing heat networks in North Ayrshire which provide heat, and at some sites electricity, to 394 dwellings. These are predominantly gas-powered Combined Heat and Power engines (CHPs) and boilers, with some biomass boilers.

There are several sources of waste heat which could contribute to a heat network, and these may be particularly relevant to potential networks in Irvine and Dalry.

8.7.3 Three Towns

The analysis shows that there is a cluster of buildings in Saltcoats and Stevenson, including several Council owned buildings, which may be viable for connecting to form a heat network. This is shown in Figure 19 and Figure 20 as Saltcoats_1_4000.

There is also an area of buildings, Ardrossan_1_400, where high heat loads are shown to be present. However, further investigation into the reliability of these heat loads would have to be considered before conducting any additional feasibility analysis.

The Stringent heat network area is shown in Figure 21. This shows that the area previously identified in the Baseline is no longer viable under these measures. However, given that the main anchor loads are Council owned and that the area does not show any significant obstacles or challenges which could increase the cost of installing a network, the Saltcoats and Stevenson coastal area may be worthy of more detailed investigation. There are also several development sites within the Local Development Plan (LDP2).

Figure 19: Saltcoats Heat Network Opportunity – 4,000 kWh/m/year

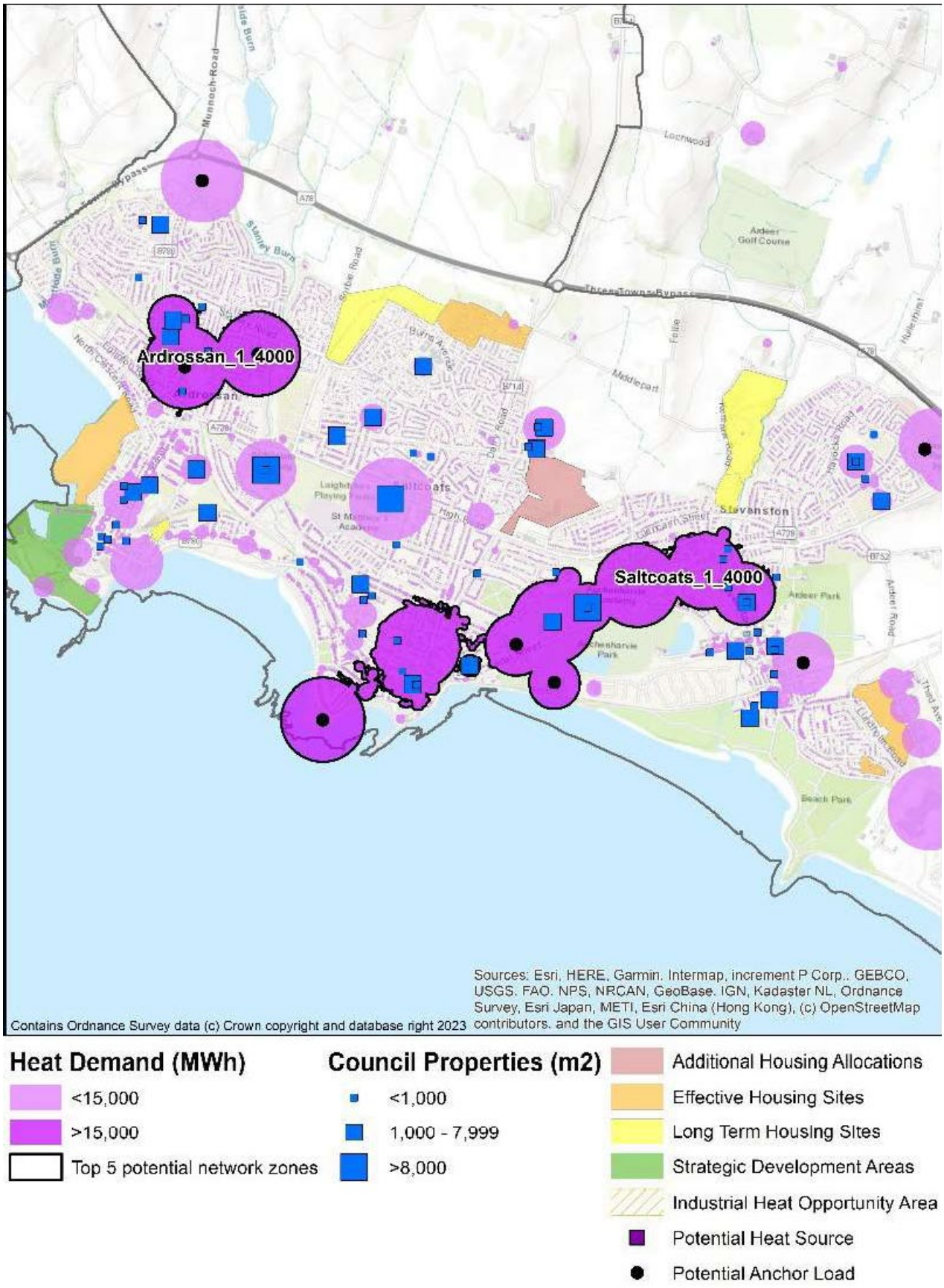
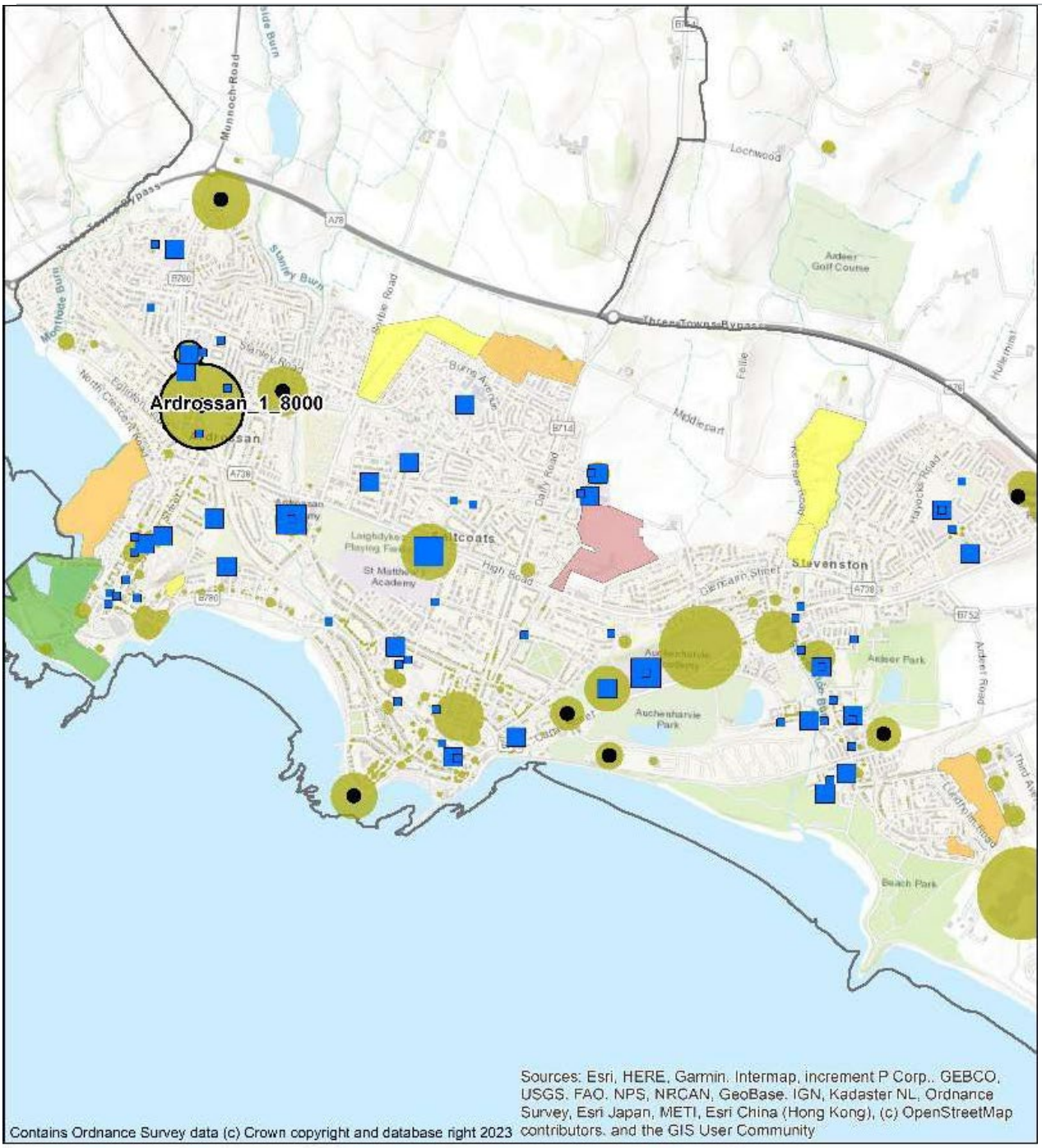


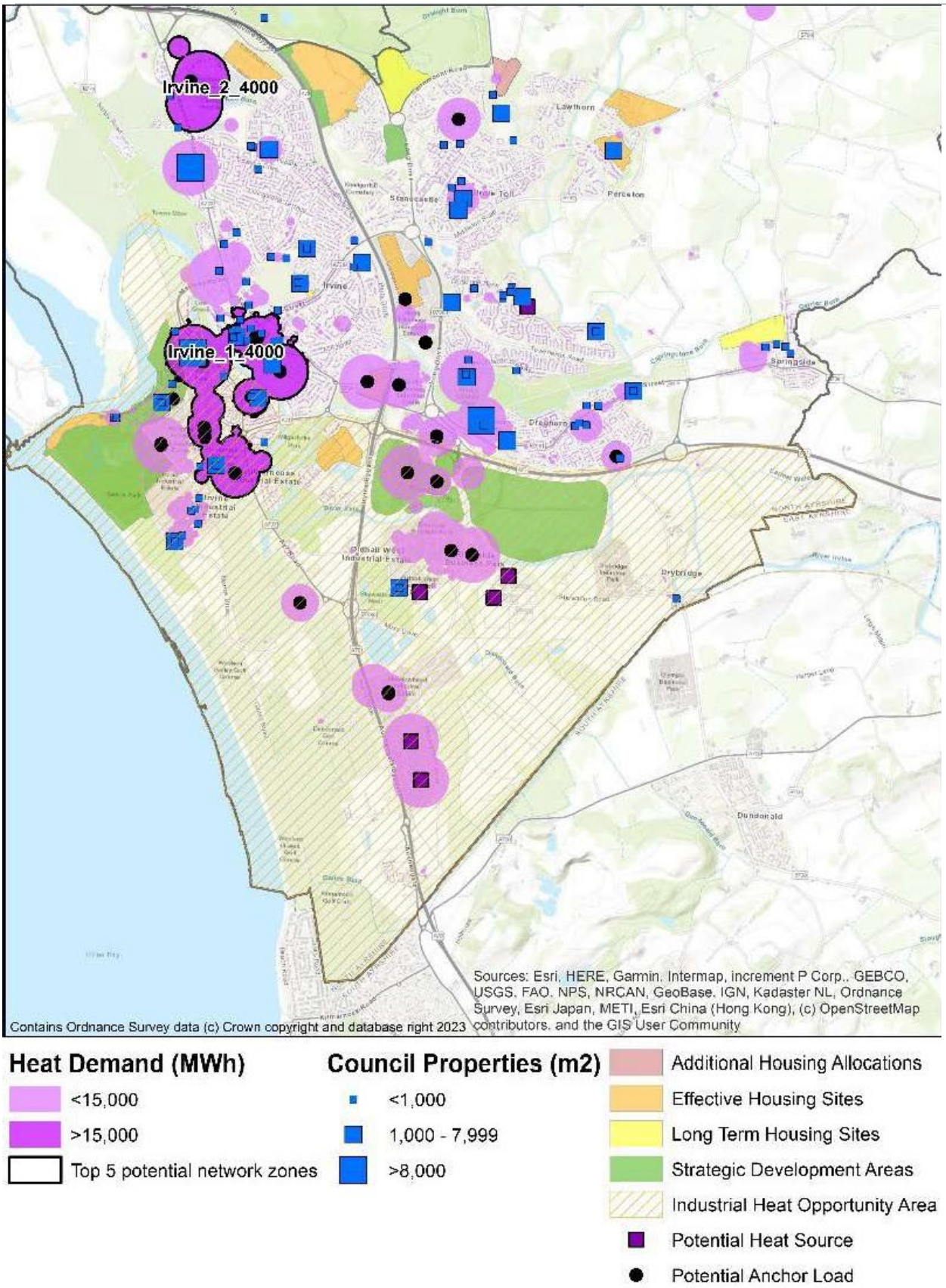
Figure 20: Three Towns Heat Network Opportunity – 8,000 kWh/m/year



8.7.4 Irvine

A potential heat network zone is shown Irvine town centre (Figure 21), with a number of Council owned non-domestic properties (shown as blue squares) as well as a range of domestic and non-domestic heat loads. Irvine_1_4000 crosses the river, and this is considered possible due to the presence of a shopping centre over the river. Engagement with the shopping centre and other stakeholders would be essential to understand the viability of a pipe route connecting both sides of the river. There is an opportunity to supply buildings in the new development areas from a heat network, engaging with stakeholders representing existing and potential future heat consumers is going to be important at feasibility stage.

Figure 21: Irvine Heat Network Opportunity – 4,000 kWh/m/year

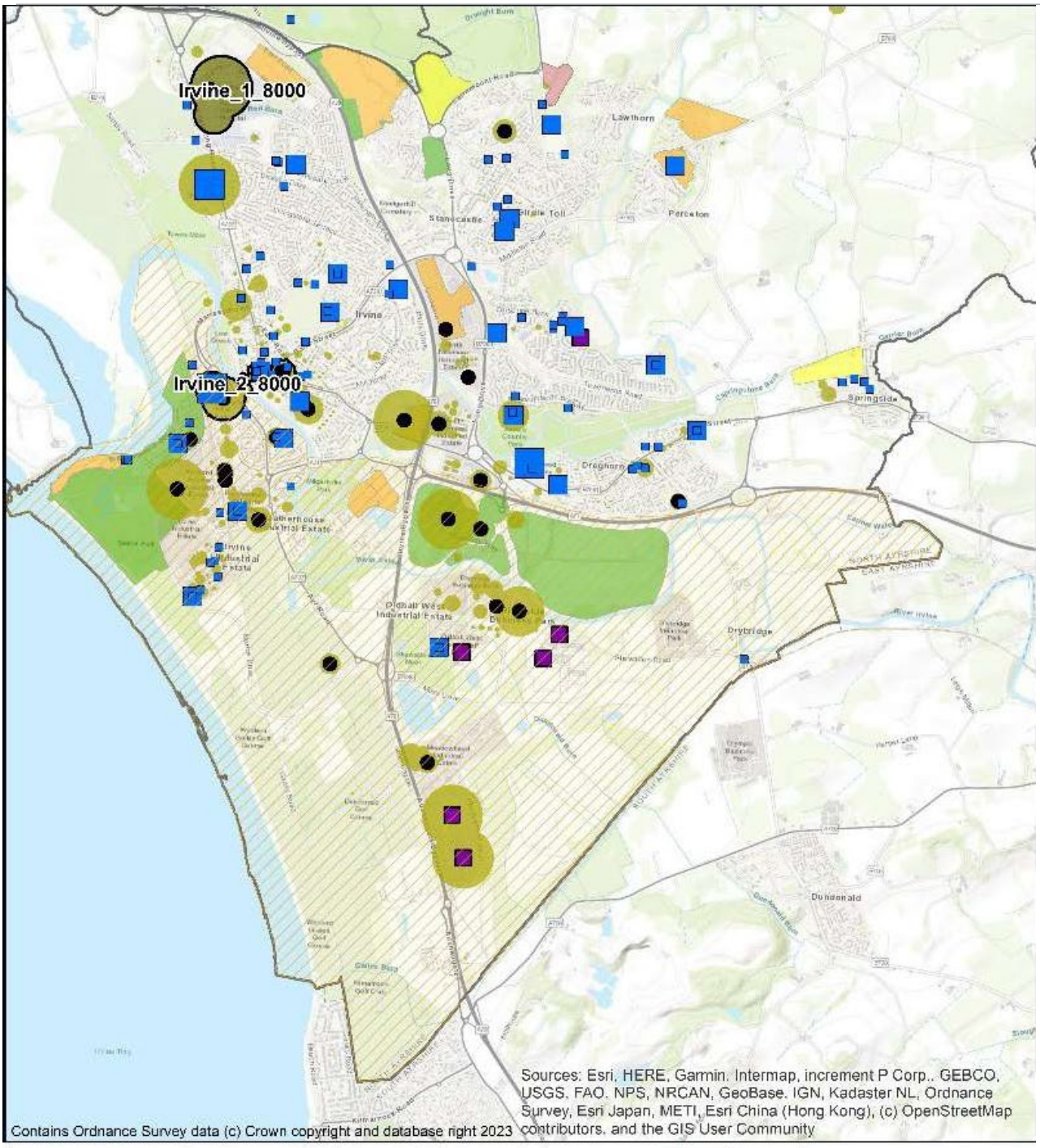


Another heat network zone is shown at Ayrshire Central Hospital, Irvine_2_4000. The exact demand could not be determined at this stage, however an estimate of heat demand for a hospital complex of comparable size was used. This zone is a cluster of buildings within the Hospital campus, however, the magnitude of the expected heat demand in this area could warrant connecting to other major heat loads, both in the town centre and en-route to the town centre. At present the size of this zone is constrained by the maximum of 250m which is considered by default as being the distance to connect anchor loads, consistent with the National Assessment methodology.

However, this is intended as a guide only and feasibility analysis is likely to show that connections over significantly greater distances are warranted to the Hospital. A feasibility study should also investigate the grades of heat used and the proportion of heat used at each grade to better understand viability.

Figure 22 shows the heat loads using the 8,000kWh/m (Stringent) scenario. This shows that within the zone identified in the town centre Irvine_1_4000 using the 4,000kWh/m (baseline) metric there is not a contiguous area with a heat demand of over 15,000MWh per year when using 8,000kWh/m metric. As such it is going to be important that future feasibility studies are informed by the most accurate data on the heat demand of these buildings, building assessement reports where available as well as consider the likely cost of routing pipework in this area in order to get an accurate assessment of heat network viability. At this stage therefore, it appears that while there is a potential zone, there is a risk that more detialled investigations will find it not to be viable and that the viaiblity of the zone is likely to be dependent upon the availability of low cost waste heat.

Figure 22: Irvine Heat Network Opportunity – 8,000 kWh/m/year



There are also a number of large industrial heat users as well as a large number of small and medium industrial sites South of Irvine. This area represents opportunities for business to business heat agreements as well as potential future networks particularly focused on industrial heat.

This study does not have sufficient data to quantify these opportunities however as set out in Section 11.8.4, the Council's Business Support and Development Team are engaging with businesses to act as a catalyst for these opportunities and to identify suitable funding where it is available.

An area to the South of Irvine had shown up as being an opportunity area on the Heat Network National Assessment. However, upon investigation it was found that the buildings are large industrial and warehouse buildings and where many of the heat loads were both estimated (low confidence) and extremely high, these heat loads were screened out on the basis that they were highly uncertain. These properties are within the wider industrial heat opportunity area to the South of Irvine and would be possible businesses for engagement by the Business Support and Development Team, as discussed in 11.8.4.

Irvine Heat Network Strategy

There are numerous heat network opportunities as well as industrial sites around Irvine and there are also potential heat sources including a consented Energy from Waste site, potential Scottish Water wastewater heat pipework from which to recover heat, as well as mine water heat opportunities.

A strategic approach to heat networking in this area could consider the possible connection of these heat loads and heat sources to form a larger-scale district heating scheme.

There may be opportunities to connect to other significant heat loads in adjoining local authorities, such as Crosshouse Hospital and industrial sites in Troon.

By considering future opportunities for wider district heating as part of zone planning, the Council will maximise the potential future for heat networking in North Ayrshire, while ensuring that there are developments which can be delivered in the short term, to start making an impact as soon as possible.

8.7.5 Largs

The heat network analysis shows that there is an area in Largs which is close to being considered a viable area but which does not met the threshold of 15,000MWh of heat (Figure 23 and Figure 24). The properties which are shown as being anchor loads are still modest in scale and predominantly blocks of flats or non-domestic commercial buildings. There are not any Council owned buildings with substantial heating demands in the heat network area. The layout of the heat loads would also present a challenge to any network designer in determining a viable pipework route as the heat loads are more distributed than, for example, the Saltcoats and Stevenson heat network opportunity.

As such, there is a lower probability that a detailed feasibility study would find that it is possible to design a viable heat network in Largs than the other areas considered.

However, the Largs area has a concentration of hard to treat properties and therefore it could be considered for more detailled investigation into consideration could be given to heat networks as a means to decarbonise heat.

Figure 23: Largs Heat Network Area – 4,000 kWh/m/year

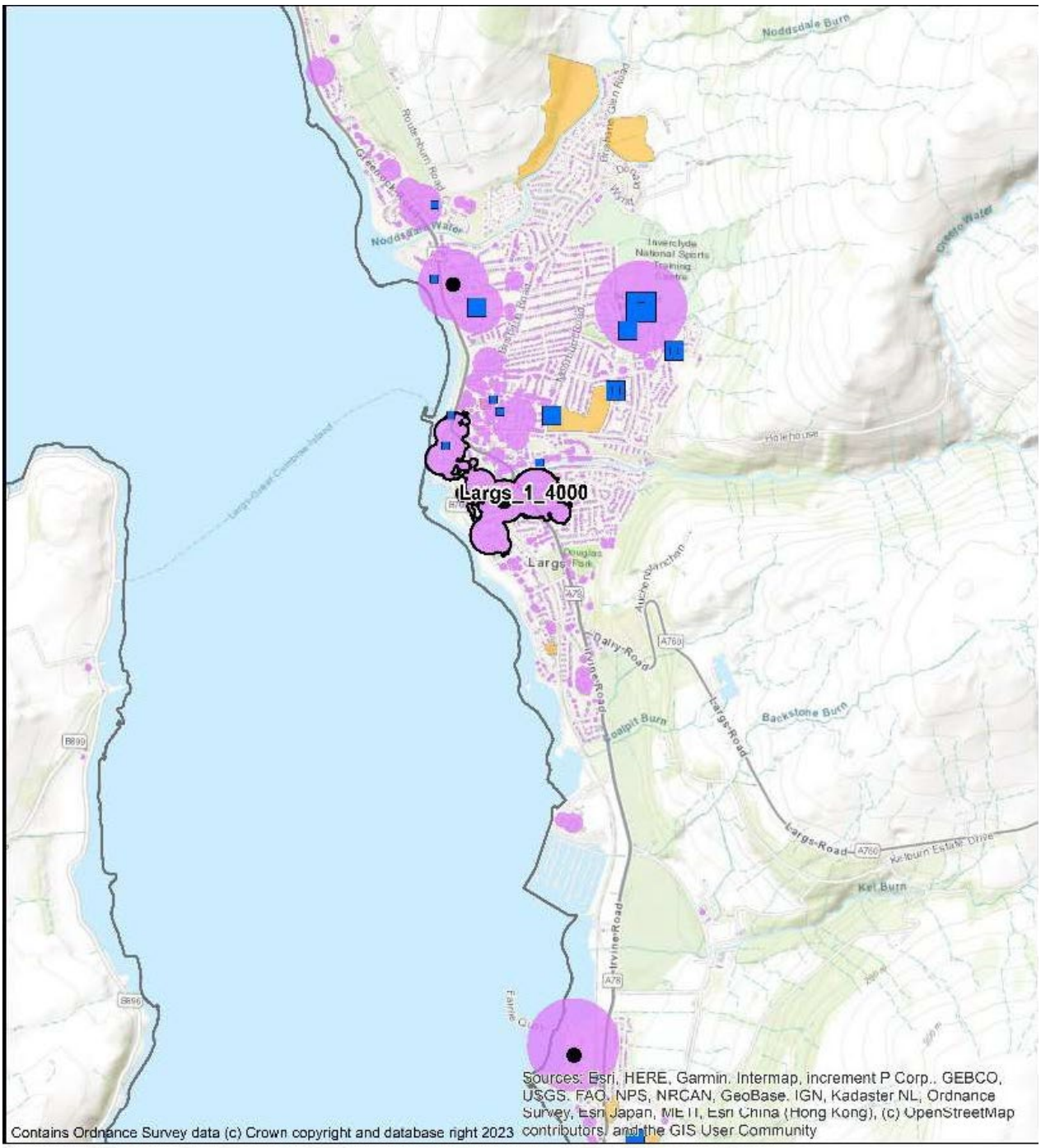
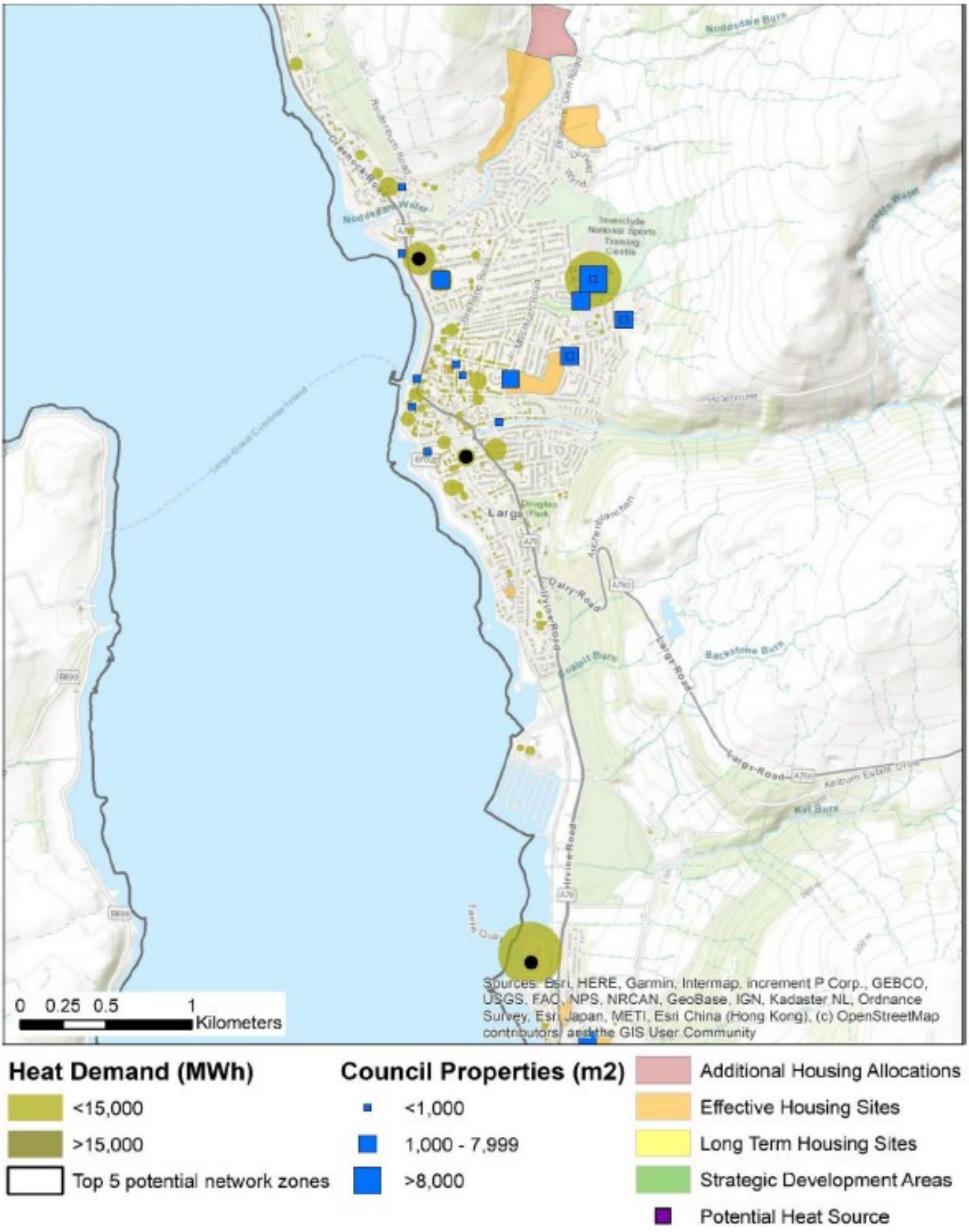


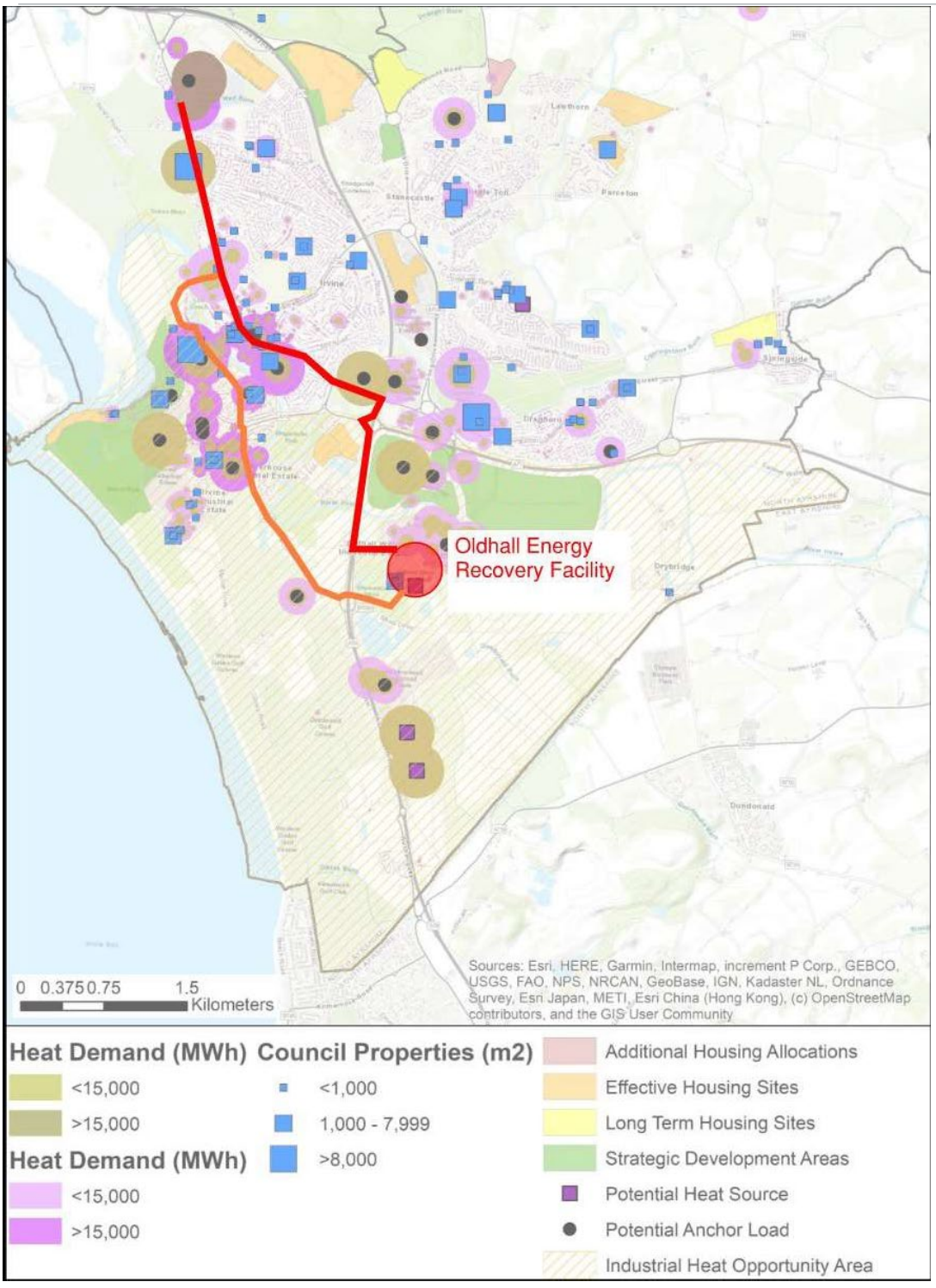
Figure 24: Largs Heat Network Area – 8,000 kWh/m/year



8.7.6 Heat sources

There is an energy from waste plant under construction, the Oldhall Energy Recovery Facility. This site could supply heat to heat network areas in Irvine. Two example connection routes are shown in Figure 25. There are a range of potential routes which would also allow the connection of additional anchor loads on route.

Figure 25: Potential to Connect Energy from Waste to Irvine



8.8 Low Carbon Heat Technologies – Other Than Heat Networks

There are a range of low carbon heating technologies which may be suitable for those properties which are outside the heat network areas, or which are unsuitable for connection.

8.8.1 Low Carbon Heating Technologies

A list of technologies considered is outlined in section 5.5, Table 8.

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 for each property. 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.

The heat pump suitability values shown, also exclude properties that already have heat pumps or biomass.

8.8.2 Individual or Communal Heat Pump Systems

It is possible for a single dwelling to have its own heating system, for a whole building to have a single heat pump system, or for many buildings to be connected together through district heating schemes.

This Strategy considers communal heat pump systems, both where a single heat pump heats a whole building or where a network of heat pumps shares a single heat source, sometimes referred to as a 5th generation heat network, with similar energy efficiency requirements as individual heat pump systems. Therefore, they are considered as a single grouping for the purposes of this Strategy.

In practice, the practicality of installing an air source or ground source heat pump in a flat depends upon multiple site-specific factors including space available, 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 compromise 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[22].

Higher temperature heat pumps can be used which remove some practical limitations such as using a shared heating/hot water system to avoid 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 several alternative solutions which have been grouped together as “other”.

Providing hot water from a heat pump requires a hot water cylinder or thermal store, as in the case of electric heating. This can be a challenge when replacing a combi-boiler, particularly in small properties and flats. A communal system can be designed for central

[22] 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.

storage of heat to avoid the need for cylinders in individual properties, however this requires a suitable space in a communal plant area, which can also be a challenge to find.

8.8.3 Assessing Suitability for Heat Pumps

This section estimates how many properties in North Ayrshire would be suitable for heat pumps. Every property would have to have a more detailed 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.

In practice, 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 Department for Energy Security and Net Zero (DESNZ) Electrification of Heat Demonstration project[23] 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."[24]

However, in practice properties with high heat demand per square meter (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, therefore criterion for the suitability of individual heat pumps is that the property must have a predicted heat demand per square metre of property of less than 160 kWh/m^2/year which equates to approximately 3 W/m^{2}K and 2,200 heating degree days or approximately 75 W/m^2 of peak heat demand. In reality, each property is different.

Of the 73,627 domestic properties in North Ayrshire, just over 41,000 could be already suitable for new heat pumps installations, as shown in Table 15.

In completing the more cost-effective energy efficiency measures the number of heat pump suitable properties increases to the majority across the area. Although over half of properties are likely to be suitable for heat pumps, the reduction in heating demand from energy efficiency improvements has added benefit of not only reducing the cost of heating, but also in reducing the size of the heat pump and reducing the requirement for radiator or electricity connection upgrades. This is due to the lower heat demands reducing the capacity and capital cost of the heat pump.

It is still important to consider applying energy efficiency measures where possible. Going a step further and completing additional energy efficiency measures which are not as cost-effective, such as external wall insulation on properties with cavity wall insulation, allows a further 3,000 properties to be classed as suitable for heat pumps by these measures.

Another criterion is also considered to allow for standard domestic heat pumps operating on a single-phase 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

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

35,000 kWh/y of heat demand. With both factors considered together, Table 14 shows the overall number of properties that are currently suitable for heat pumps, which is just under 65,900.

Using these criteria can then help identify and target specific properties that are most in need of additional energy efficiency upgrades, including those which are not as cost-effective.

There are other challenges with locating heat pumps, such as finding a suitable location on the outside of flats or installing 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 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.

Table 14: Heat Pump Suitability

Heat Pump Suitability	Currently	After cost effective energy efficiency measures	After all energy efficiency measures
No. of Properties <160kWh/m^2/y	41,604	62,765	65,962
No. of Properties <35,000kWh/y	72,561	73,354	73,417
<160kWh/m^2/y and <35,000kWh/y	41,546	62,679	65,889

This leaves around 7,700 properties less likely to be suitable for heat pumps. A building-by-building assessment may find other ways to improve the feasibility of heat pumps, such as other energy efficiency measures beyond the standard windows, walls and loft upgrades considered so far. Flats account for 72% of the properties less likely to be suitable for individual heat pumps but may be suitable for communal systems, however this would require investigations of specific buildings.

In the lowest demand properties electric heating is an option for providing low carbon heat where the total cost of heat is consistent with fuel poverty targets. This is explored in Section 9.

In larger properties which are not considered suitable in this Strategy due to the capacity of heating they require, there are several possible low carbon heating solutions, such as Biomass boilers or heating systems consisting of a combination of a heat pump and a backup heat source. In places where the electricity connection allows, it may be possible to

install multiple heat pumps or a 3-phase heat pump. However, this is more likely to incur additional charges for electricity connection upgrades and needs to be treated on a case-by-case basis which is beyond the scope of this Strategy.

This Strategy uses an alternative methodology to categorise properties based on their suitability for heat pumps. The Domestic Baseline Tool methodology is available in Appendix C.

8.9 Building-Level Heat Decarbonisation

For decarbonising and reducing fuel poverty across the region, Table 15 shows how each key measure can contribute to each locality.

Due to the relatively low heat demand density across most of North Ayrshire potential district heating opportunities are limited to around 3.5% of the domestic properties.

Most buildings are suitable for heat pumps after insulation measures have been considered. Many properties in a potential heat network zone may also be suitable for heat pumps.

Combining the suitability of these two measures leaves the remaining buildings which would require further investigation on the best steps forward to decarbonise them, as discussed in Section 8.8. Although there is a reasonable distribution of these properties across the Council, there are higher absolute numbers in the rural areas due to larger amounts of flats which are less suitable for individual heat pump installations.

Table 15: Impact of Measures on Domestic Buildings by Locality

Strategic Zone	Properties	Potential Heat Network Opportunities	Suitable for a Heat Pump	Biomass	Not Suitable for a Heat Network or a Heat Pump and Not Using Biomass	Not Suitable for Heat Network or Heat Pump (%)
Arran	3,778	N/A	2,672	181	7,288	29%
Garnock Valley	10,650	N/A	9,240	26	1,106	13%
Irvine	19,533	578	18,844	72	1,410	3%
Kilwinning	8,239	N/A	7,967	6	603	3%
North Coast and Cumbraes	14,044	924	11,176	14	272	19%
Three Towns	17,383	1,107	15,990	35	2,651	7%

9. Delivery Areas

9.1 Spatial approach

9.1.1 Purpose

This section is to set out how interventions could be prioritised and to identify specific areas for possible action. It considers the characteristics of the buildings in North Ayrshire in more detail using a spatial approach. It shows differences between areas of North Ayrshire with respect to the LHEES Considerations. This approach is designed to allow areas to be identified 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.

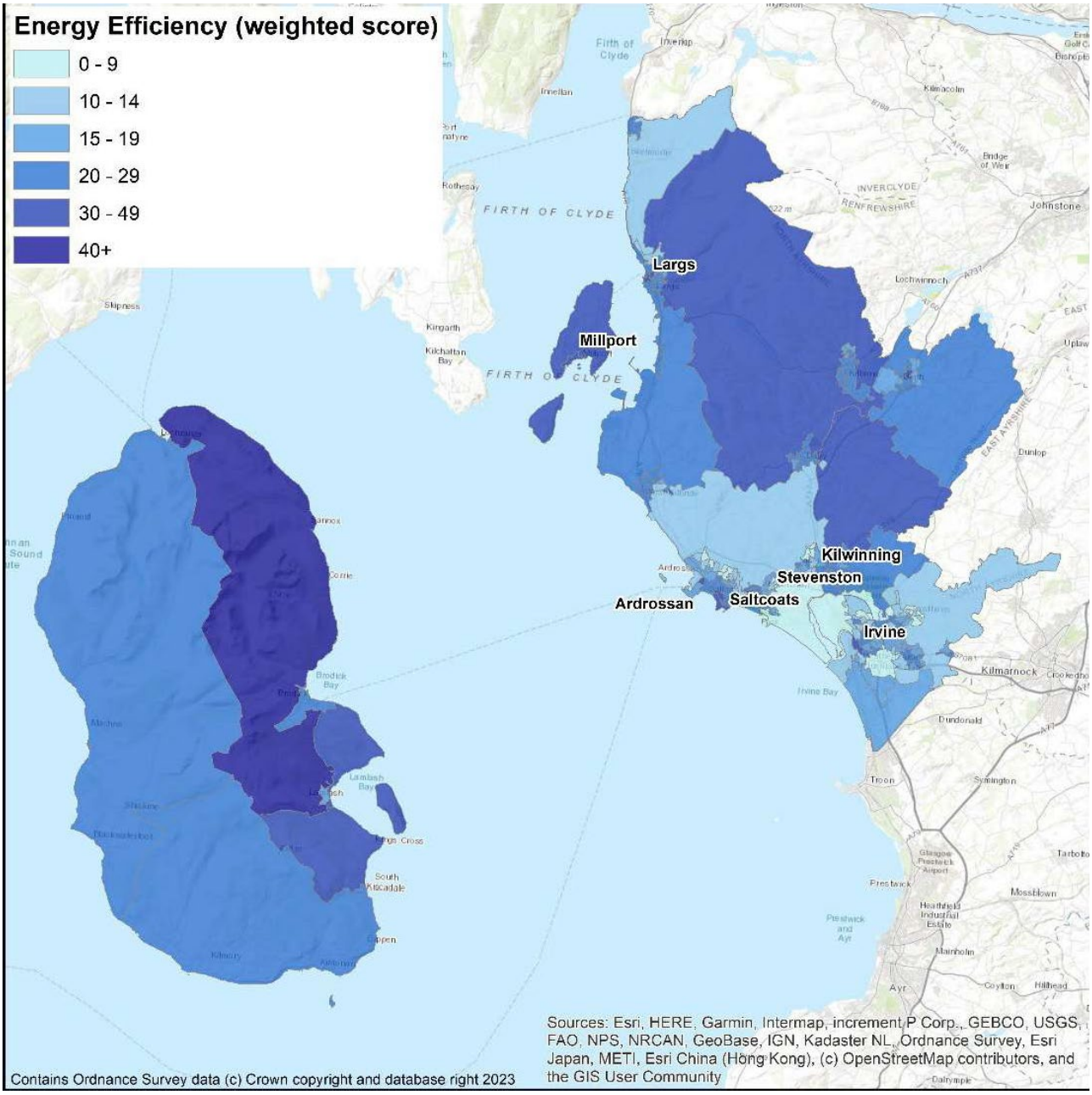
The analysis set out in this section is conducted at higher spatial granularity than in Section 8 to allow targeting of delivery actions.

9.1.2 Energy Efficiency

The attributes of each domestic property were taken from the Home Analytics data. This contains information on the construction of each building and the suitability for 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 F. The score for each data zone was calculated using a version of the LHEES Baseline Tool, adapted to provide outputs at Delivery Area resolution.

The map in Figure 26, shows how different areas of North Ayrshire have the potential to improve energy efficiency by a comparatively greater or lesser extent. The darker the shade on the map, the less energy efficient the average property in that area.

Figure 26: Map of Weighted Energy Efficiency Score – Data Zone Level



The data zones vary significantly in size, with more populated locations having more properties in an area. Figure 27 and Figure 28 show the same information at a more detailed resolution. It can then be seen there is significant variation in energy efficiency within the urban centres. As such a targeted approach where interventions are focused on a specific area of poor energy efficiency seems possible.

Figure 27: Weighted Energy Efficiency Score – Data Zone Level: Detail 1

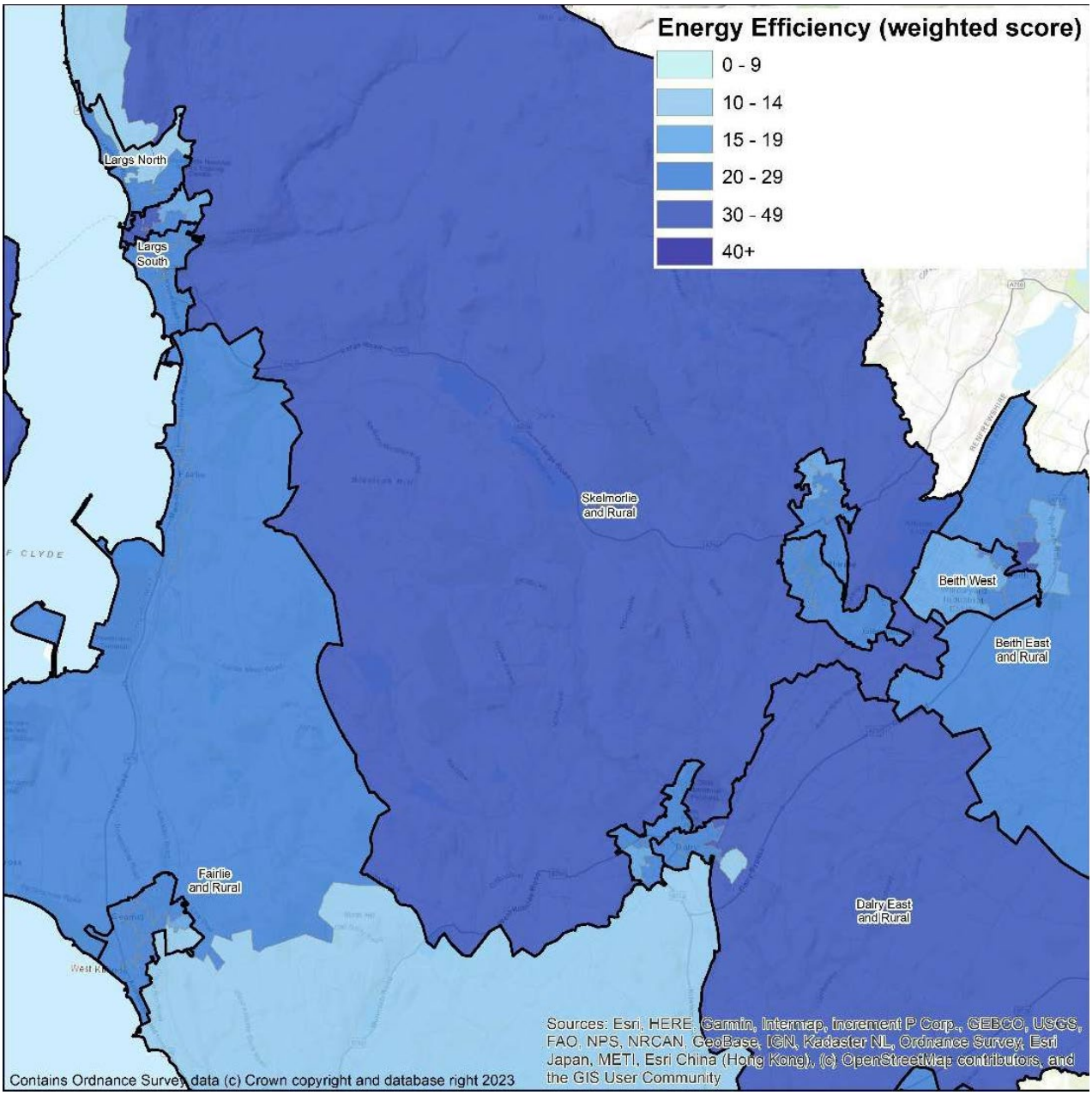
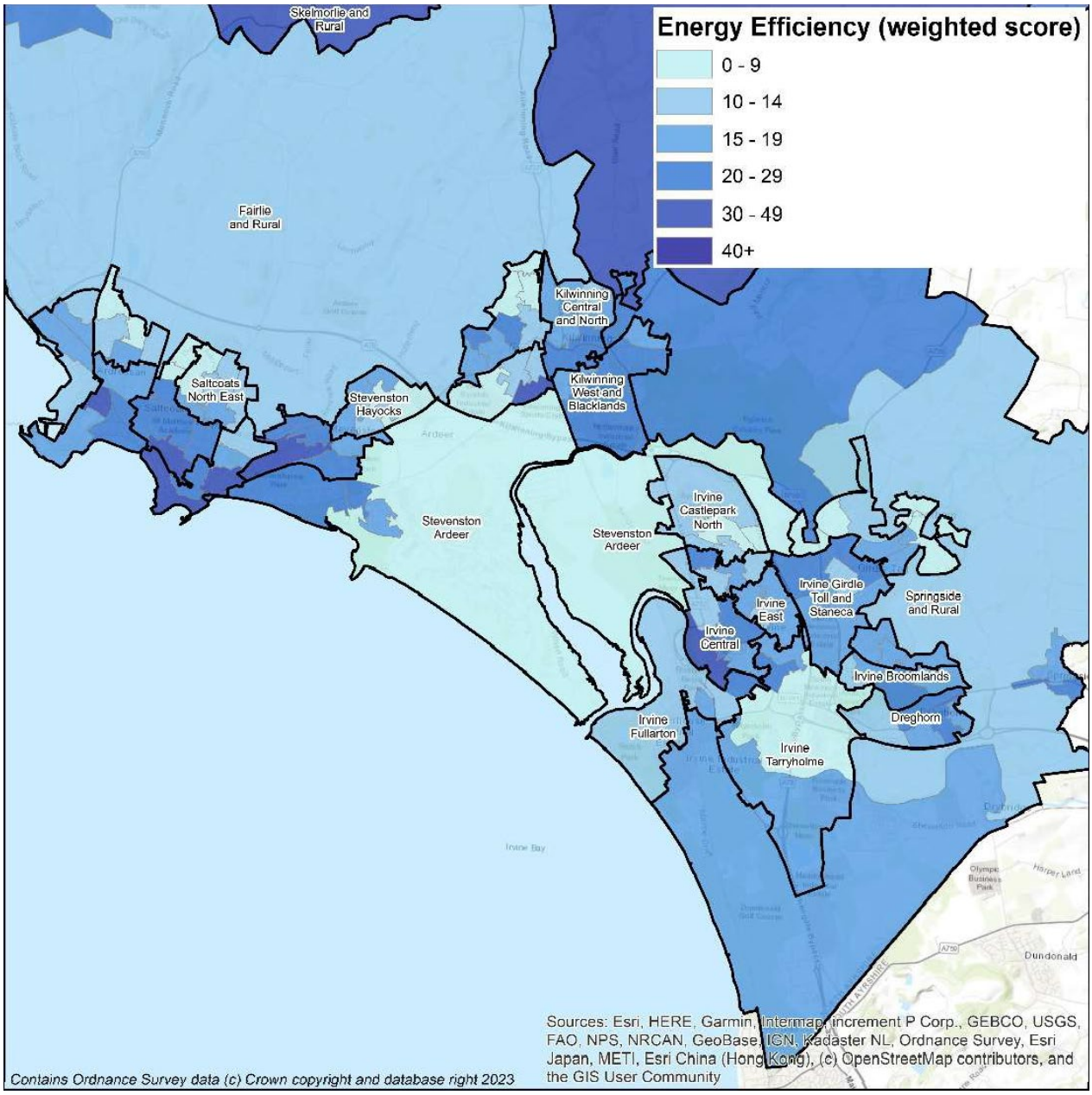
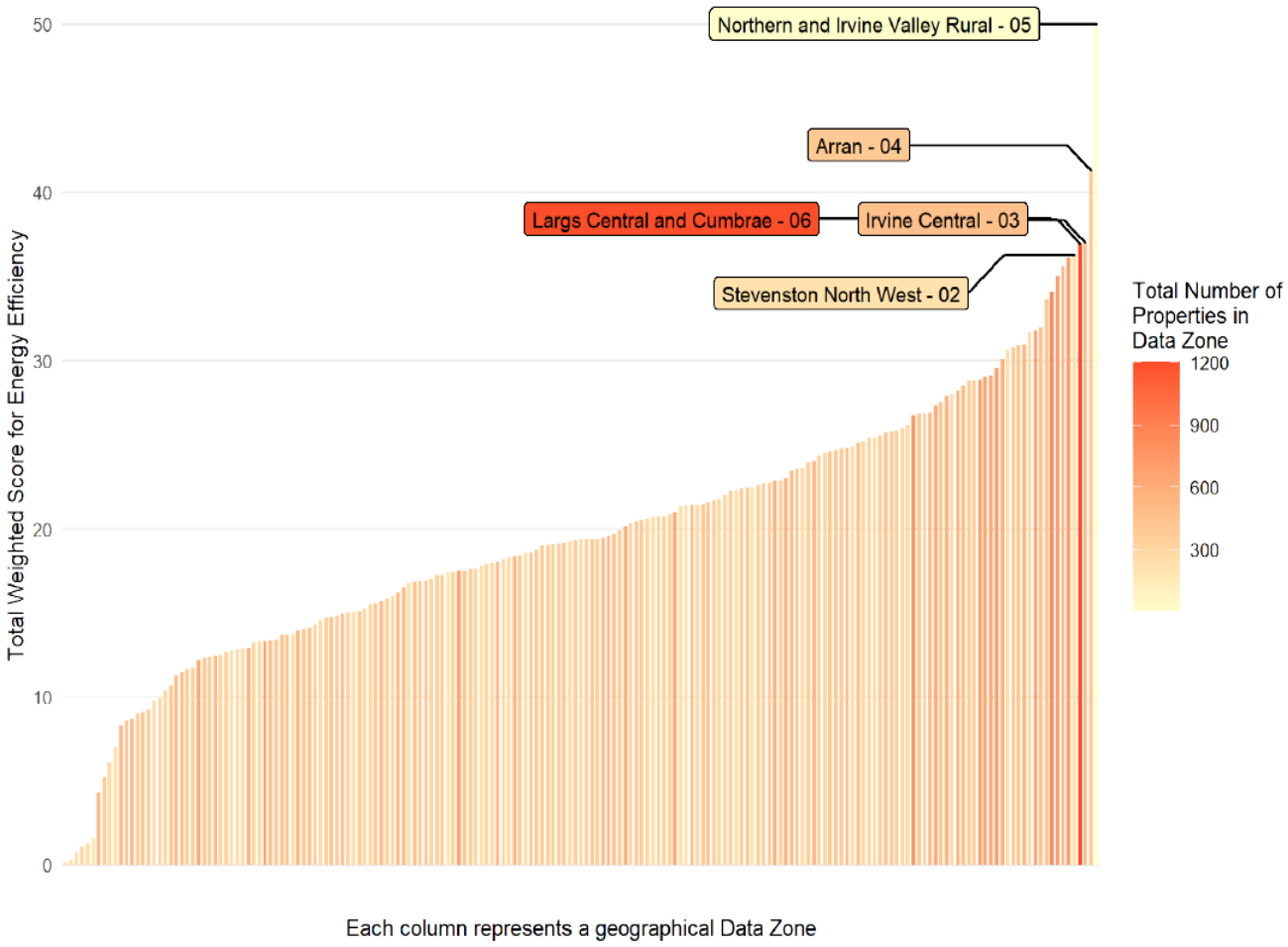


Figure 28: Weighted Energy Efficiency Score – Data Zone Level: Detail 2



The histogram in Figure 29 visualises each data zone's Weighted Energy Efficiency Score; the zones are sorted from the lowest score to the highest and coloured according to the total number of domestic properties in the zone. This shows the uneven distribution of the Score: some zones have a significantly higher number of potential interventions required to drive down energy demand while other zones require fewer. The middle of the range has a gradual increase in interventions along the ranking. Refer to Appendix B for details of the individual Data Zones.

Figure 29: Histogram of Weighted Energy Efficiency Score – Data Zone Level



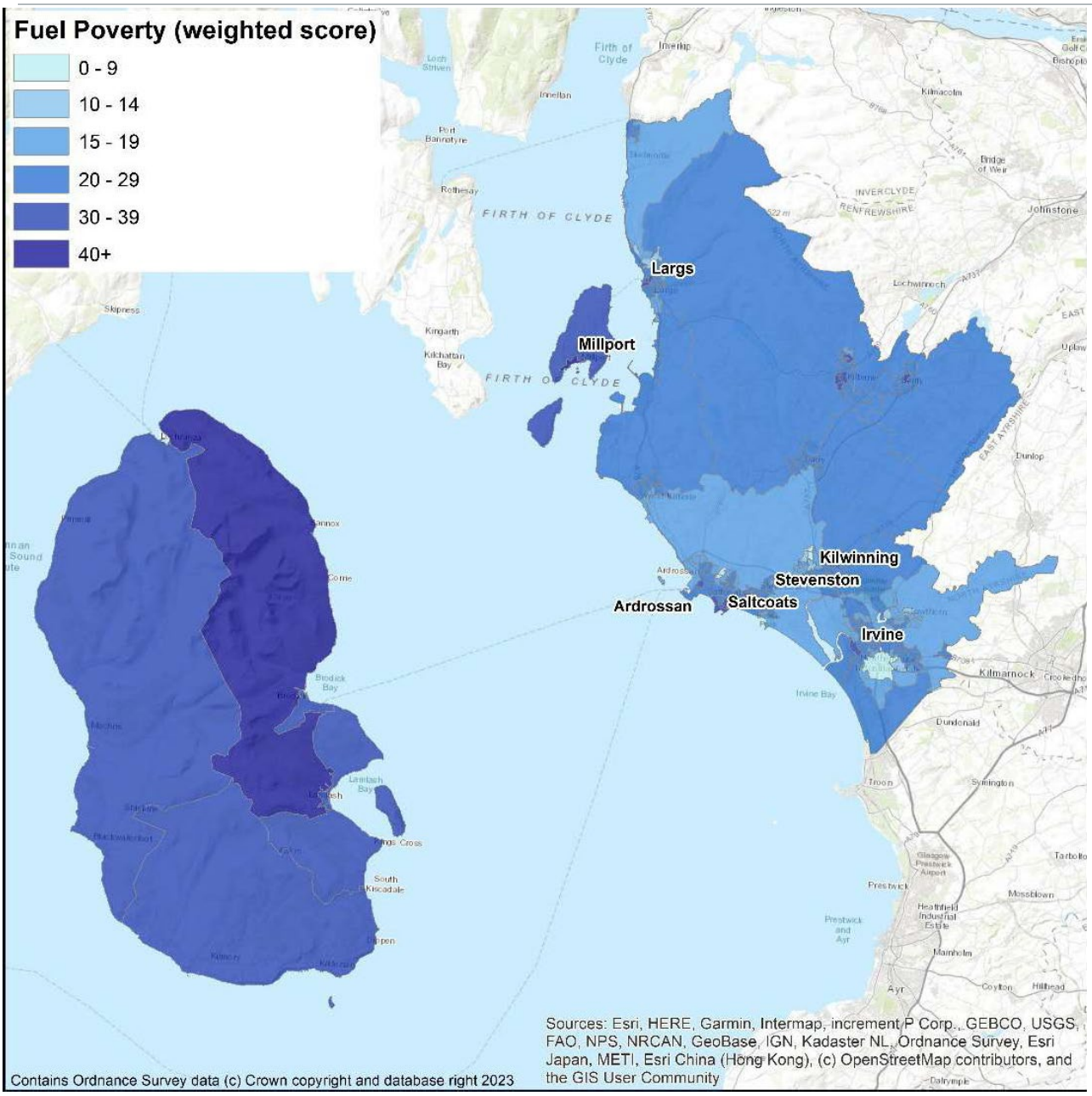
Top five Data Zones highlighted- see Appendix B for full list

9.1.3 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 F.

When looking at the weighted fuel poverty score by data zone in Figure 30, areas are highlighted that are not apparent when analysing at strategic zone level. The higher resolution analysis reveals that the “Largs and Cumbrae - 06” data zone has the highest risk of fuel poverty in the Council area, this data zone primarily covers Millport, in Cumbrae itself. Similarly, this analysis reveals that the north-east of Arran is at a higher risk of fuel poverty than other areas of the island.

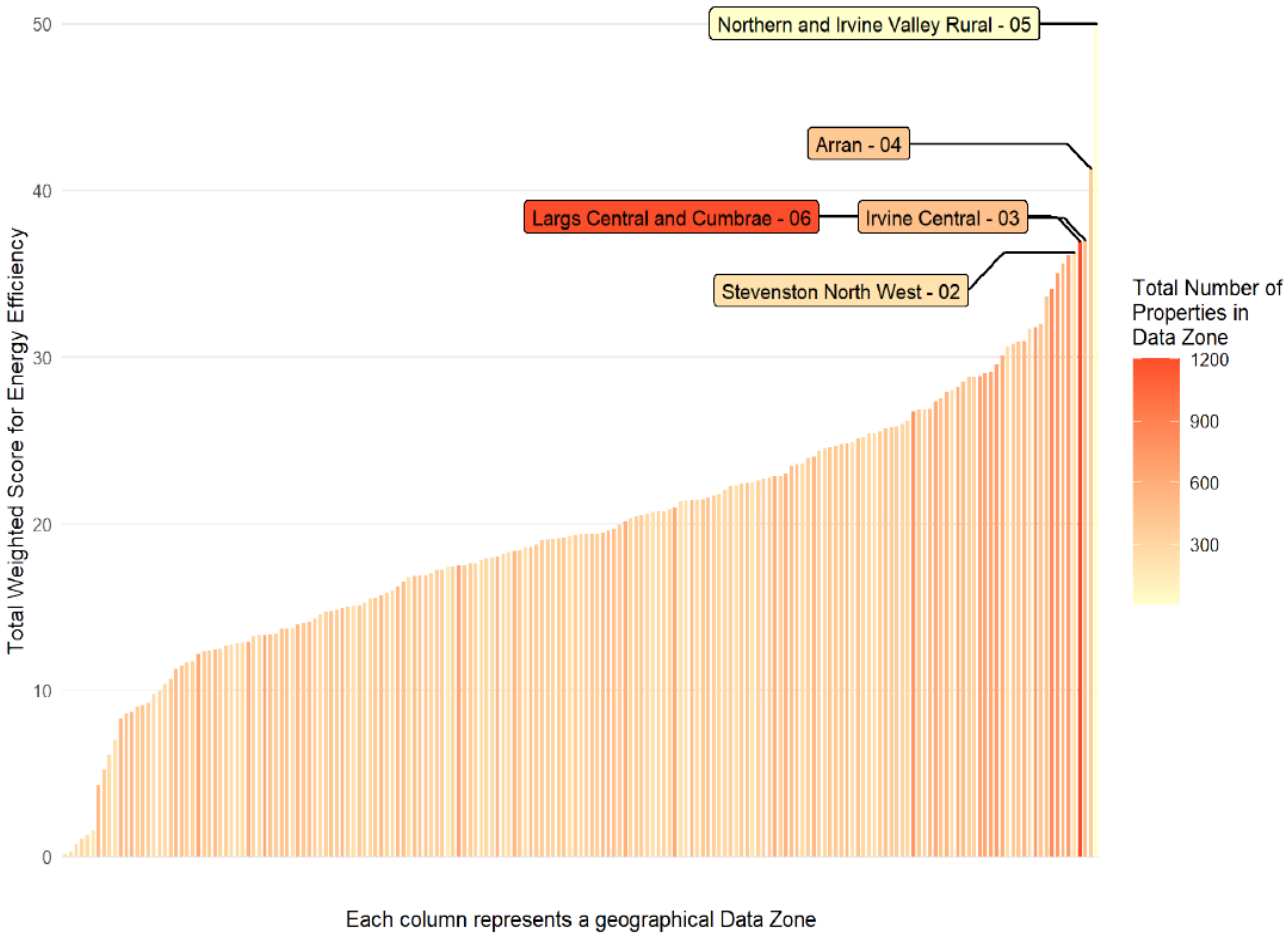
Figure 30: Map of Energy Efficiency as a Driver of Fuel Poverty – Data Zone Level



The data zone level analysis also reveals several data zones within the three towns area, see Appendix B.

Figure 31 highlights the distribution of Total Weighted Fuel Poverty Scores. The distribution of interventions follows a similar shape to that of poor energy efficiency, although with slight variations on ranking of data zones. Refer to Appendix B for details of the individual Data Zones.

Figure 31: Histogram of Weighted Fuel Poverty Score – Data Zone Level



Top five Data Zones highlighted- see Appendix B for full list

It is also worth noting that the areas with highest fuel poverty levels do not necessarily receive the highest weighted score. This is because the weighting is equally influenced by those properties with the greatest potential for energy efficiency improvements to reduce fuel poverty.

It would be important that building level analysis investigates the extent to which energy efficiency measures are possible in these properties.

The central data zones within some urban areas such as Ardrossan and Saltcoats, as well as areas of Cumbrae and Arran, have clusters of older properties with traditional building types which can be harder to insulate. Therefore, it could be useful to consider what other measures would be possible that are not considered in this analysis. For example, measures to reduce the air infiltration rate of buildings may have a significant effect on driving down energy demands but are not considered here.

Significant progress needs to be met straight away to achieve the 2035 Scottish Government target of 75% reduction in emissions, with continual progress to ensure fuel poverty is reduced as far as reasonably possible by 2040.

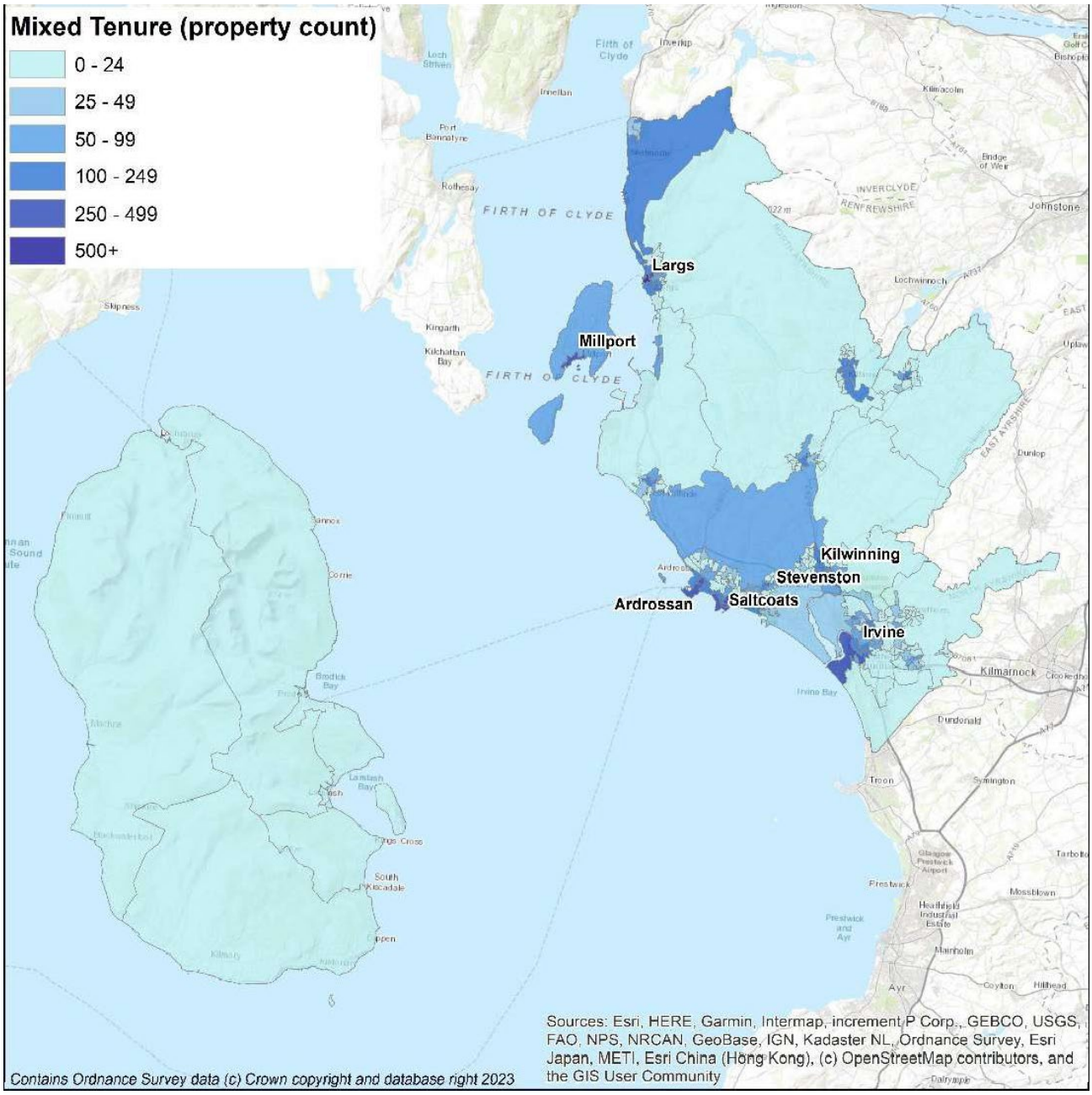
In summary, while energy efficiency and fuel poverty risk certainly need to be addressed in the urban zones identified, there is evidence of an increased risk of fuel poverty in rural areas. This is likely to require separate actions to reduce fuel poverty risk in these areas.

9.1.4 Mixed-tenure and Mixed-use

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 with the same function, predominantly all residential dwellings, 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.

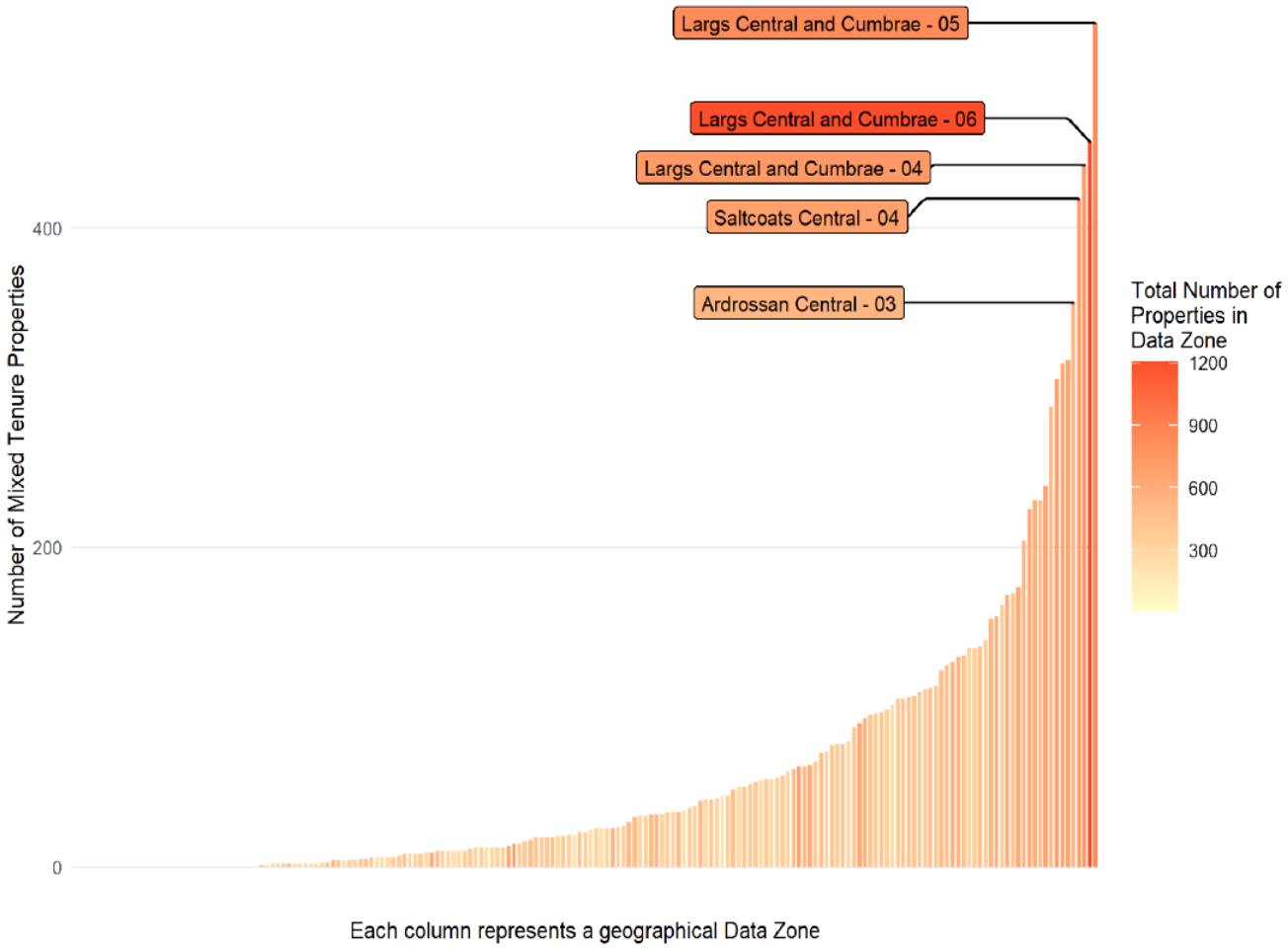
The mixed-tenure properties are predominantly clustered around urban regions of the Council area such as Largs, the Three Towns and Irvine as well as smaller towns across the Council area (Figure 32). The largest grouping of mixed tenure buildings is found most heavily in Largs. This needs to be taken into account with the Delivery Plan for interventions in these areas: urban centres tend to have a larger number of mixed-tenure properties, however there are a considerable amount in some rural datazones such as Fairlie and Rural.

Figure 32: Map of Mixed Tenure Properties – Data Zone Level



Ranking the data zones by the number of mixed tenure buildings as shown in Figure 33 demonstrates that many data zones do contain mixed tenure buildings. 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 demand/profiles.

Figure 33: Histogram of Number of Mixed Tenure Buildings – Data Zone Level



Top five Data Zones highlighted- see Appendix B for full list

9.1.5 Fuel Poverty – Absolute

The fuel poverty indicator analysis used in the baseline tool was supplemented with additional analysis based on the heat demands presented in the Home Analytics data set and subsequent cost to heat each property. This building level analysis was amalgamated to intermediate zone. The cost analysis is highly correlated to the utility prices used in the model. The prices used in the analysis are shown in Table 16.

Table 16: Fuel Prices Used in Fuel Poverty Analysis[25]

Fuel	Autumn 2023 Price Cap
Electricity Rate	£0.270
Mains Gas	£0.070
Oil	£0.116
LPG	£0.119
Biomass/Solid	£0.068
Standing Charges	
Mains Gas	£0.30
Electricity	£0.53

The energy price cap from October to December 2023 is used in the analysis. Increases in tariffs from the energy crisis risk pushing more households into fuel poverty when combined with historically high inflation rates and high cost of living.

The analysis shown in Table 17 indicates the percentage of properties within each intermediate zone that a household in income decile 5 could live in, without being in fuel poverty. Given that income decile 10 represents the top 10% of earners, households in decile 5 are approaching average household income. This analysis is intended to provide an indication of how affordable it is to heat houses in each area and not a detailed prediction. It uses the heat demands in each building based on Home Analytics data and it assumes that buildings are heated fully and are based on the utility costs presented above. The analysis is based on the fuel that each property is described as having in the Home Analytics data set.

The analysis shows, there are a wide range of properties that households in decile 5 on the income scale would be pushed into fuel poverty. Households in lower deciles would also be in fuel poverty.

Under the "price cap" scenario fewer than 1% of properties could be occupied by the lowest 10% of earners without them being in fuel poverty.

[25] Energy price cap | Ofgem

Table 17: Percentage of Homes Which can be Lived in by Households in Income Decile 5 Without Being in Fuel Poverty.

Intermediate Zone	Autumn 2023 Price Cap
Arran	4%
Skelmorlie and Rural	39%
Largs North	41%
Fairlie and Rural	48%
Largs Central and Cumbrae	48%
Largs South	49%
West Kilbride and Seamill	49%
Beith East and Rural	51%
Kilbirnie North	53%
Saltcoats North West	54%
Springside and Rural	57%
Ardrossan North West	63%
Dalry East and Rural	63%
Irvine Tarryholme	64%
Kilwinning Central and North	66%
Stevenston North West	67%
Kilwinning Whitehirst Park and Woodside	68%
Irvine Perceton and Lawthorn	71%
Kilbirnie South and Longbar	71%
Dalry West	72%
Irvine Central	72%
Beith West	74%
Irvine Fullarton	75%
Ardrossan North East	78%
Saltcoats Central	78%
Stevenston Hayocks	80%
Dreghorn	81%
Irvine Girdle Toll and Stanecastle	81%
Ardrossan Central	82%
Saltcoats North East	82%
Stevenston Ardeer	82%
Irvine Castlepark North	83%
Irvine Castlepark South	83%
Kilwinning West and Blacklands	83%
Kilwinning Pennyburn	84%
Irvine Bourtreehill	86%
Irvine East	88%
Irvine Broomlands	91%

Table 17 demonstrates that there are some areas where households on incomes close to the national average, have relatively few properties that they could afford to sufficiently heat without being in fuel poverty. Since this methodology is solely focused on the total cost of heating a property, areas where properties have a higher heat demand will be highlighted as an increased risk. This analysis does not consider socio-economic factors such as the variation in the number of households in each decile in different areas.

In conclusion, while energy efficiency and fuel poverty risk certainly need addressing in the urban zones identified, this adds evidence to there being an increased risk of fuel poverty in rural areas. This is likely to require separate actions to move that property out of fuel poverty risk.

9.1.6 Social Impact of Multiple Deprivation (SIMD)

The Local Heat and Energy Efficiency Strategy and Delivery Plan considers fuel poverty where it can be reduced through energy efficiency measures. Understanding which locations have higher rates of deprivation, especially income deprivation, although all aspects should be included, can inform decisions on areas of focus. These are shown in Figure 34 and Figure 35. SIMD decile 1 contains the most deprived 10% of data zones and decile 10 contains the least deprived 10% of data zones.

Figure 34: Map of Overall SIMD Deciles

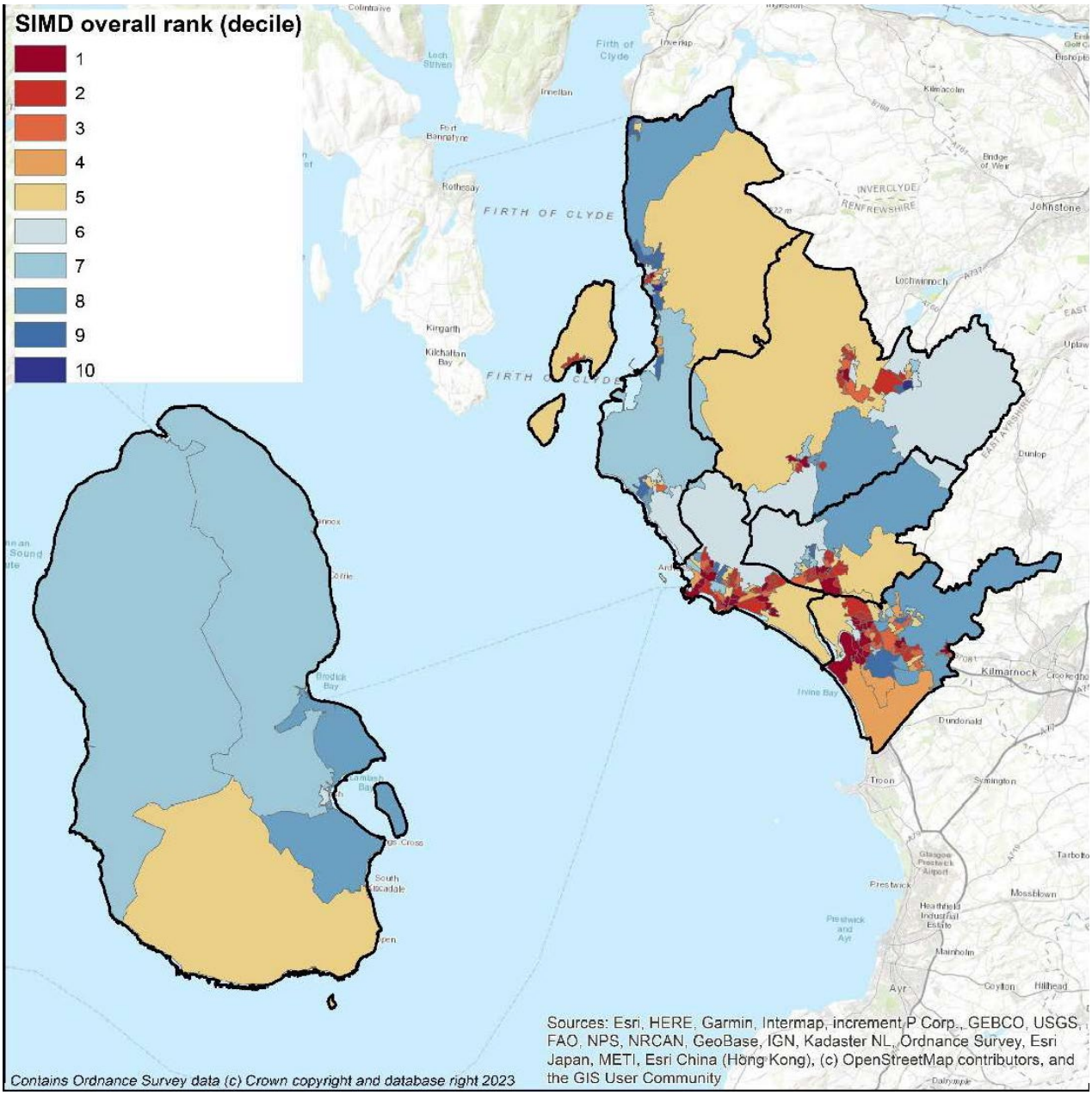
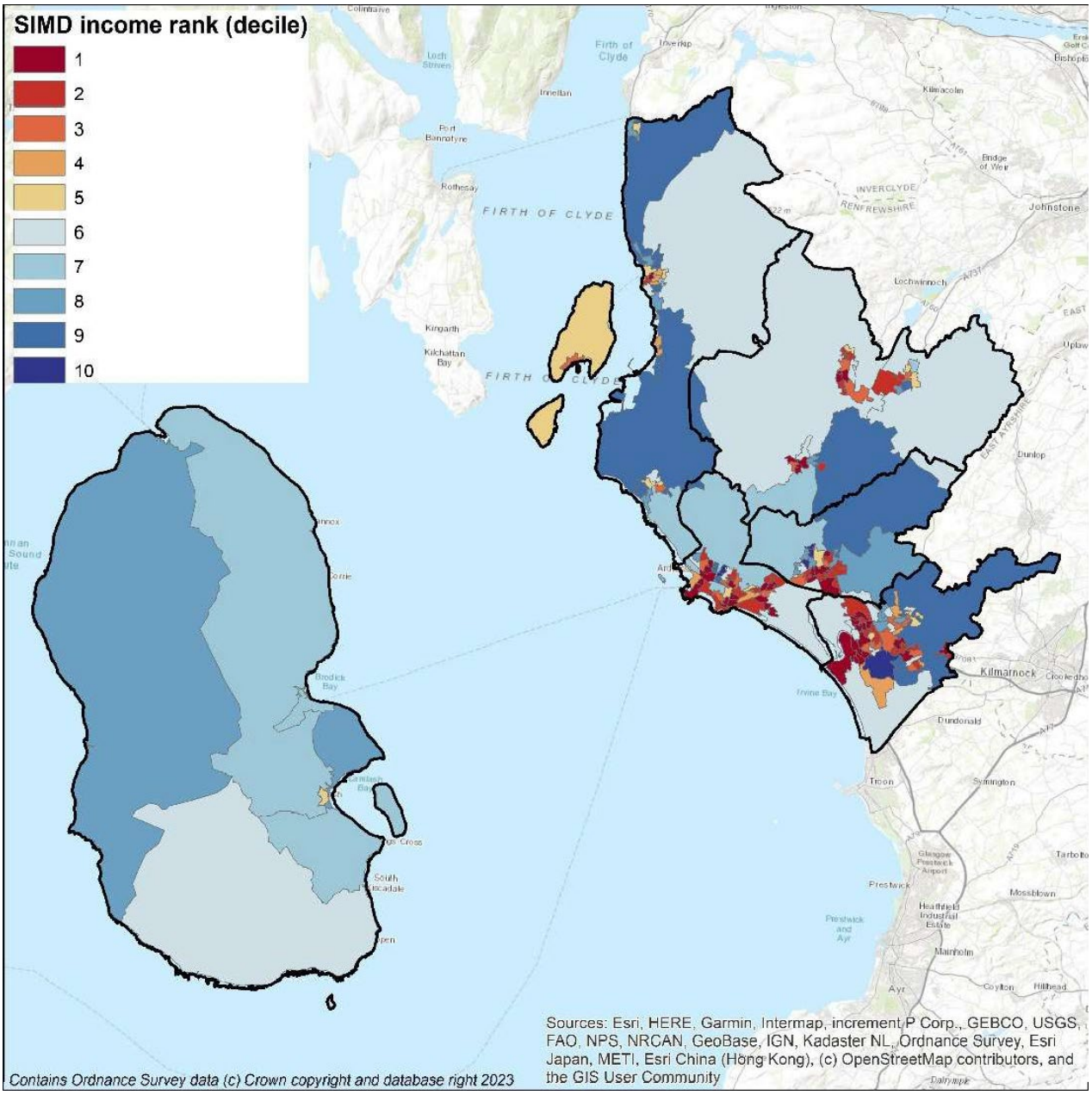


Figure 35: Map of SIMD Income Deciles



9.1.7 Multiple Considerations

This report highlights potential delivery areas for each Consideration. There may be differences between which areas should be targeted first depending on priorities. To help identify which data zones could form the initial delivery areas, Table 18 shows the different considerations for the data zones that are ranked by energy efficiency as a driver for fuel poverty.

The green highlighted cells in Table 18 show the data zones that are in the top third for other LHEES considerations and SIMD (a full list is provided in Appendix B). All the data zones with buildings in conservation areas appear in the top third of energy efficiency as a driver for fuel poverty zones. Overall, this shows a high correlation between Considerations, except for SIMD. Therefore, an approach focused on areas with low SIMD rankings, or low SIMD income rankings would exclude many areas which the LHEES Baseline Tool suggests as having higher priority.

Table 18: Multiple Considerations

Data Zone – Ranked by energy efficiency as a driver for fuel poverty	Energy efficiency - rank	Mixed tenure - rank	Buildings with >1 dwelling - rank	Listed buildings graded A-C - rank	Buildings in conservation area - rank	SIMD
Largs Central and Cumbrae -06	4	2	1	6	1	2
Arran – 04	2	135	107	16	11	7
Largs Central and Cumbrae - 07	6	55	13	4	4	5
Northern and Irvine Valley Rural - 05	1	154	171	68	26	8
Arran – 07	21	108	64	24	26	8
Arran – 06	7	140	70	5	7	8
Arran – 03	10	134	90	30	26	8
Ardrossan Central - 03	14	5	9	68	26	1
Arran – 02	20	122	67	43	26	5
Arran - 01	34	107	69	21	26	7
Arran - 05	87	149	103	56	26	6

Data Zone – Ranked by energy efficiency as a driver for fuel poverty	Energy efficiency - rank	Mixed tenure - rank	Buildings with >1 dwelling - rank	Listed buildings graded A-C - rank	Buildings in conservation area - rank	SIMD
Largs Central and Cumbrae - 05	9	1	2	12	26	2
Kilwinning Pennyburn - 02	13	154	171	68	26	2
Kilbirnie South and Longbar - 02	33	154	154	68	26	2
Saltcoats Central - 04	19	4	4	11	26	1
Kilbirnie South and Longbar - 03	65	154	160	68	26	2
Largs Central and Cumbrae - 04	12	3	3	31	26	1
Saltcoats Central - 03	18	12	8	41	26	1
Irvine Central - 03	3	11	16	2	3	1
Saltcoats Central - 05	8	8	6	65	26	2

9.1.8 Heat pump suitability

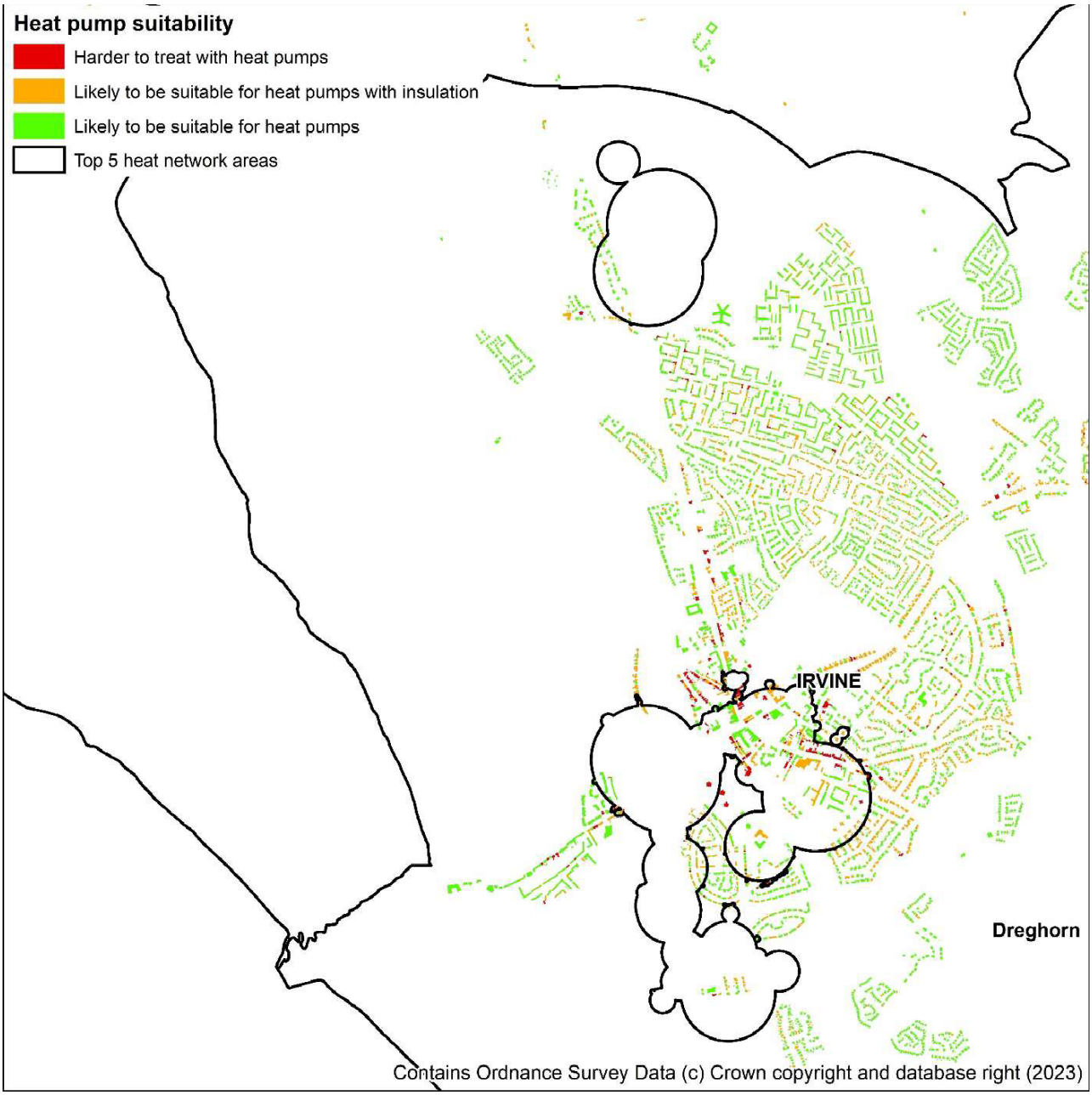
This section highlights where there are significant proportion of properties where there is a greater challenge with implementing a heat pump solution, even after reasonable energy efficiency measures are considered.

Low temperature solutions may be possible by solving challenges for a specific building type. Other technologies such as air-to-air heat pumps may have specific applications such as small flats with few rooms.

There are a range of possible solutions depending upon the building type, however when combining the heat network analysis with the potential for heat pumps this shows where there are clusters of properties which are likely to be hard to treat.

Further analysis of these clusters could be considered to identify which solution is most appropriate for that specific area. While it may be that an ideal solution is then found, it may be that none of the possible solutions are ideal. In this case, engaging with stakeholders and understanding the specific needs of building owners and households is going to be particularly important to the Council identifying what role it can play in identifying potential solutions and supporting their implementation. Maps of the largest towns are in Appendix E. An example is shown below in Figure 36.

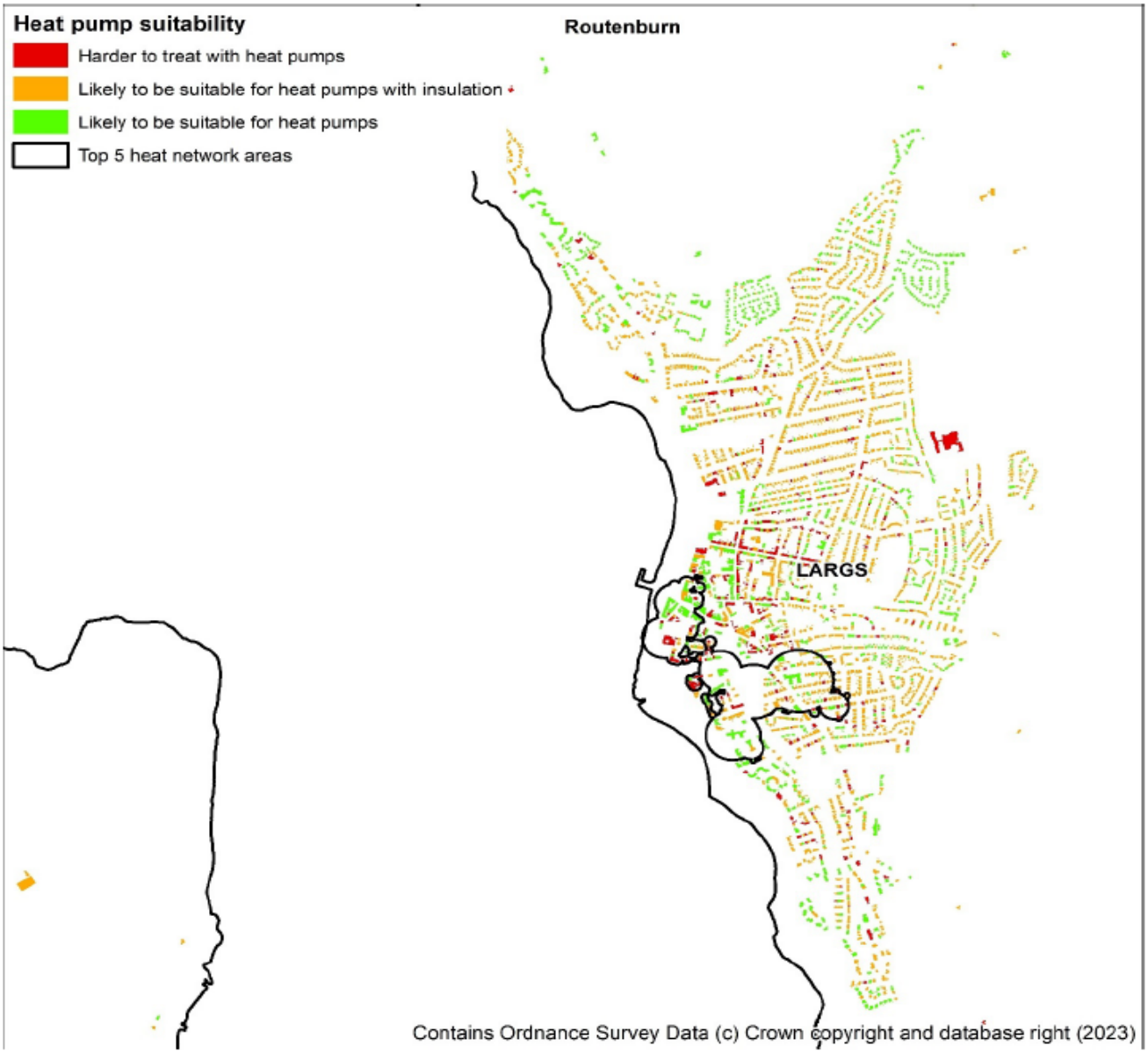
Figure 36: Heat Pump Suitability – Irvine



This map shows that there are a substantial number of properties which are potentially suitable for heat pumps, however there is a concentration of properties which are likely to be harder to treat with heat pumps in the Town Centre, close to the area of heat network viability.

Conversely in Largs, Figure 37, we can see that there are some larger clusters of buildings where they are less likely to be suitable for heat pumps. This is often the case in town centres. It may prove possible to treat these buildings once detailed surveys are carried out.

Figure 37: Heat Pump Suitability – Largs



9.2 Technology-Led Approach

9.2.1 Purpose

In this section, the interventions are grouped 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.

9.2.2 Logic for Technology Grouping

In addition to considering the data on each building's construction, type and insulation levels by data zone, analysis was carried out based on the other attributes pertinent to implementing measures and who can make relevant decisions. In this section, the interventions are grouped by tenure and the fuel being displaced to aggregate the interventions in an alternative way. This allows comparison of costs and benefits of installing different measures to be considered for a specific tenure.

The Council can play a different role in encouraging the installation of energy efficiency and low carbon heat sources in different tenures, meaning this analysis is intended to inform decisions throughout the next five years.

Energy efficiency measures are considered key interventions to help both reduction of fuel poverty and decarbonisation by reducing heat demands leading to lower carbon emissions. In addition, the implementation of energy efficiency measures improves the operational effectiveness and the sizing requirement of heat pumps.

There are two heating technologies which have the most potential to improve both energy efficiency, contribute to decarbonisation and potentially reduce fuel poverty:

- District heat networks are a key technology in areas with higher heat density makes them viable and in some new build estates; but
- The main route forward for buildings across North Ayrshire is the installation of heat pumps either for a specific dwelling or a communal system serving a number of dwellings, such as a block of flats.

For any heat source which uses electricity, including heat pumps, electricity tariffs can have a significant effect on operating costs. Some tariffs with specific lower cost periods can be used but can require more intervention from the household to change settings compared to tariffs with a fixed usage rate. It is important that householders have access to good advice on selecting the appropriate tariffs for their needs and the needs of any members of their households.

There are a range of technologies which could be considered for properties less suitable to heat networks or conventional heat pump technologies. This includes air-to-air heat pumps, biomass, high temperature heat pumps and electric heating.

9.2.3 Intervention Categories

The data on each individual property has been assessed and the measures that each property is suitable for has been estimated. They are grouped according to LHEES Consideration and tenure.

The potential interventions are grouped by the factors which would affect their implementation. As such, Table 19 forms a list from which actions can be selected rather than a list being committed to at this stage.

An individual property may appear multiple times in Table 19 if it requires multiple interventions. It is possible that, due to programming, the multiple interventions would take place at the same time, but that is not an imperative i.e., all the windows in a data zone could be upgraded at a separate time to loft insulation. Details of each of these possible interventions are set out in Appendix G.

Table 19: Intervention Summary Table

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
1	1) Off-gas grid buildings	All	Not applicable	Not applicable	Not applicable	10,447	Not applicable
2	2) On-gas grid buildings	All	Not applicable	Gas	Not applicable	63,180	Assumed 561 unknown buildings are on gas grid
3	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Wall insulation	Not applicable	3.1 Investigate if wall insulation can be added 3.2 Add wall insulation where feasible	3,142	Not applicable
4	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Windows	Not applicable	4.1 Survey properties with single glazing 4.2 Upgrade windows to double glazing	1,711	Not applicable
5	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Loft insulation	Not applicable	5.1 Survey properties with missing data. 5.2 Upgrade all insulation to over 330 mm glass wool (or equivalent)	2,649	There should be an economy of scale

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
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	819	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	39	Not applicable
8	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Local Authority	Heat pump installation	Gas	8.1 install ASHP 8.2 install electric cooker	10,210	Not applicable
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	6	Not applicable
10	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Wall insulation	All	NAC Housing Association Working Group	745	Not applicable
11	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Windows	All	NAC Housing Association Working Group	252	Not applicable
12	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Loft insulation	All	NAC Housing Association Working Group	1,588	Not applicable
13	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Electricity	NAC Housing Association Working Group	511	Not applicable
14	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Oil/ LPG	NAC Housing Association Working Group	17	Not applicable

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
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	NAC Housing Association Working Group	3,344	Not applicable
16	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Housing Association	Heat pump installation	Solid / biomass	NAC Housing Association Working Group for solid fuelled buildings	4	Not applicable
17	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Wall insulation	All	NAC Owner Occupier Working Group	23,244	Not applicable
18	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Windows	All	NAC Owner Occupier Working Group	3,305	Not applicable
19	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Loft insulation	All	NAC Owner Occupier Working Group	20,372	Not applicable
20	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Electricity	NAC Owner Occupier Working Group	5,107	Not applicable
21	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Oil / LPG	NAC Owner Occupier Working Group	2,642	Not applicable
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	NAC Owner Occupier Working Group	40,912	Not applicable
23	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Occupier Owned	Heat pump installation	Solid / biomass	NAC Owner Occupier Working Group for solid fuelled buildings	355	Not applicable
24	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Wall insulation	All	NAC Privately Rented Working Group	5,025	Not applicable

Ref	LHEES Consideration	Tenure	Measure	Displaced Fuel	Action	Number of Properties	Notes
25	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Windows	All	NAC Privately Rented Working Group	919	Not applicable
26	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Loft insulation	All	NAC Privately Rented Working Group	3,452	Not applicable
27	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Electricity	NAC Privately Rented Working Group	1,329	Not applicable
28	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Oil / LPG	NAC Privately Rented Working Group	426	Not applicable
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	NAC Privately Rented Working Group	6,577	Not applicable
30	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver of fuel poverty	Privately Rented	Heat pump installation	Solid / biomass	NAC Privately Rented Working Group for solid fuelled buildings	31	Not applicable
31	6) Mixed-Tenure / Mixed-Use	All	-	All	Not applicable	10,736	For info
32	6) Conservation Area	All	-	All	Not applicable	3,783	For info
33	6) National Park	All	-	All	Not applicable	-	For info
34	6) Historic Building (listed)	All	-	All	Not applicable	1,158	For info
35	3) Heat Networks	All	-	All	Heat network feasibility studies	2,733	For info

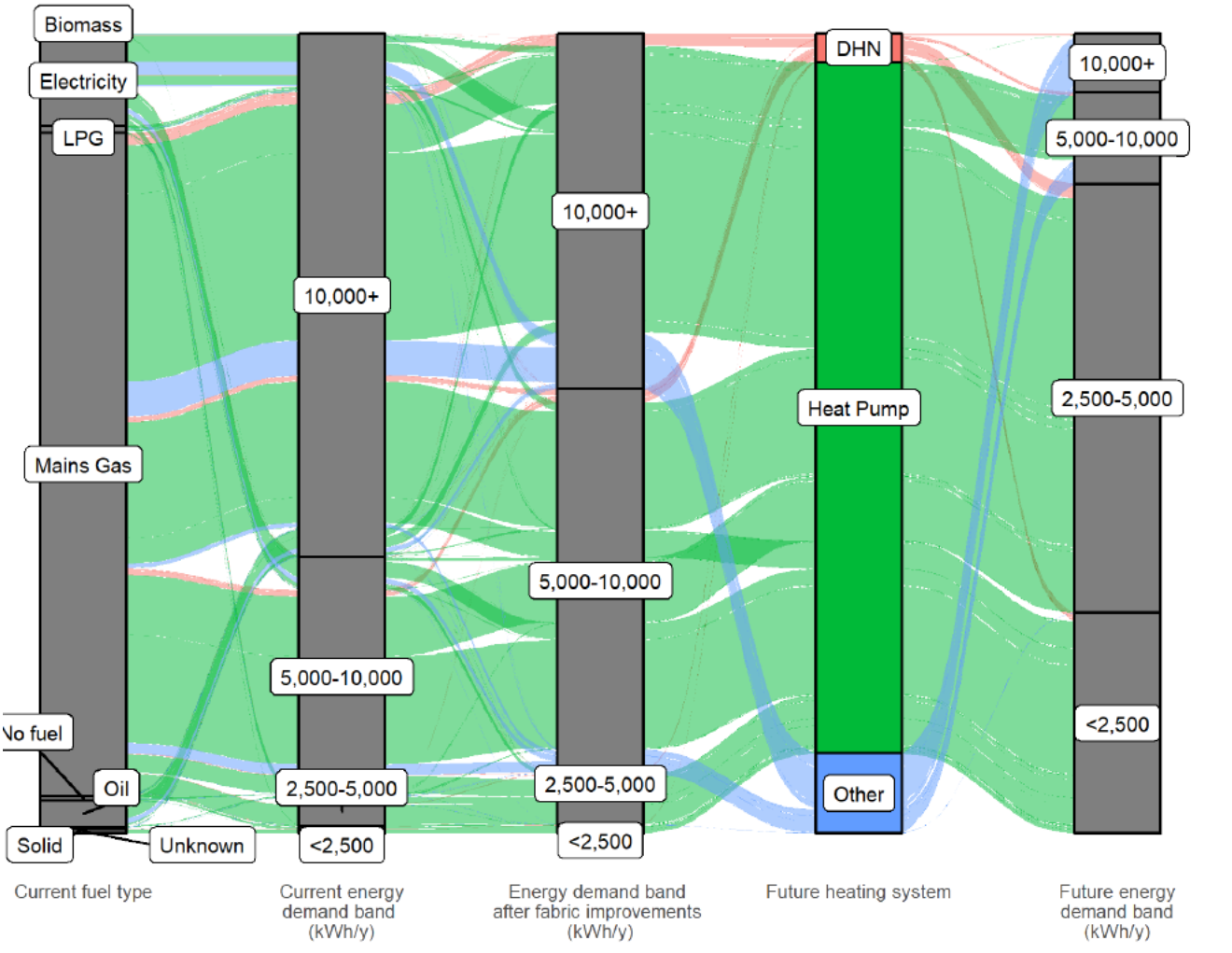
10. Pathways for all of North Ayrshire

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

10.1 Decarbonisation of Heat Pathway

If we consider the actions which could be taken by each property, assume reasonable energy efficiency measures are installed and then consider that the building owner decides to install the most suitable low carbon heating system, then we can get an impression of the potential pathway for North Ayrshire overall, based on today's technologies. This is shown in Figure 38 below.

Figure 38: Decarbonisation and Energy Efficiency Pathway



The first column shows how many properties start their journey to decarbonisation with each fuel source. The second groups the properties by their total heat demand, in kWh per year. The third column assumes reasonable energy efficiency measures have been applied and groups the properties by revised heat demand. The suitability of each property for each of the low carbon heat sources is then shown in the fourth column. This assumes all five areas for heat networks (listed in 10.2) are developed but doesn't consider further expansion. It can be clearly seen the high proportion of properties for which heat pumps are the most suitable technology.

Finally, the column on the right shows the future 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.

The measures included in this scenario are outlined in more detail in the Section 11. It shows that while applying these energy efficiency measures significantly reduces heat demand, there are properties which continue to have moderate heat demands. These properties could either be treated with energy efficiency measures which cost more to install or a number of other interventions, but more detailed investigation is required to understand these specific homes and their needs.

The limiting factor on whether a heat network is a suitable heating technology is a locational one (i.e., the buildings need to be within the heat network boundaries identified). There may be some properties where there are physical restrictions preventing district heating and similarly more detailed feasibility could envelop additional properties within the heat network boundaries. Many of these properties would be suitable for other low carbon heating if district heating proves not to be viable, or if heating systems need replaced prior to a district heating scheme being developed.

As set out in Section 8.8, heat pumps are considered the most favourable low carbon heating technology for buildings which are not in district heating areas (i.e., most buildings within North Ayrshire). The criteria on which a property is considered suitable is also set out in that section.

Even with energy efficiency measures, there are 9 % of properties not likely to be suitable for either district heating or heat pumps. While there may be specific solutions for these properties, the data available does not allow detailed identification within the scope of this report and factors such as tenure, property heat demand and location will affect the optimal solution for each household and property owner.

Options could include:

- Higher temperature heat pump systems (systems supplying at > c. 60 °C which are typically suited to larger demands, but still operating at high COPs),
- Low temperature heat pump systems with more advanced radiators (e.g. low temperature fan coil units which these are higher cost units),
- Electric heating,
- Biomass in some specific circumstances,
- Communal heating systems, using one of the technologies above.

The heat network analysis is focused on large centralised systems and smaller heat networks of a cluster of buildings or communal systems and could still be considered for campus sites or where a single organisation owns multiple buildings.

Figure 39 displays a similar pathway, but with no energy efficiency measures. This shows that where there are property owners who need to replace their heating system, for example if it stops working, but time or budget does not allow installation of energy efficiency measures prior to this, there are still a significant proportion who could chose a low carbon heating solution. Energy efficiency measures are preferable to both reduce heat demand and fuel poverty, but properties could still be considered after low carbon heating is installed.

Figure 39: Decarbonisation of Heat Pathway

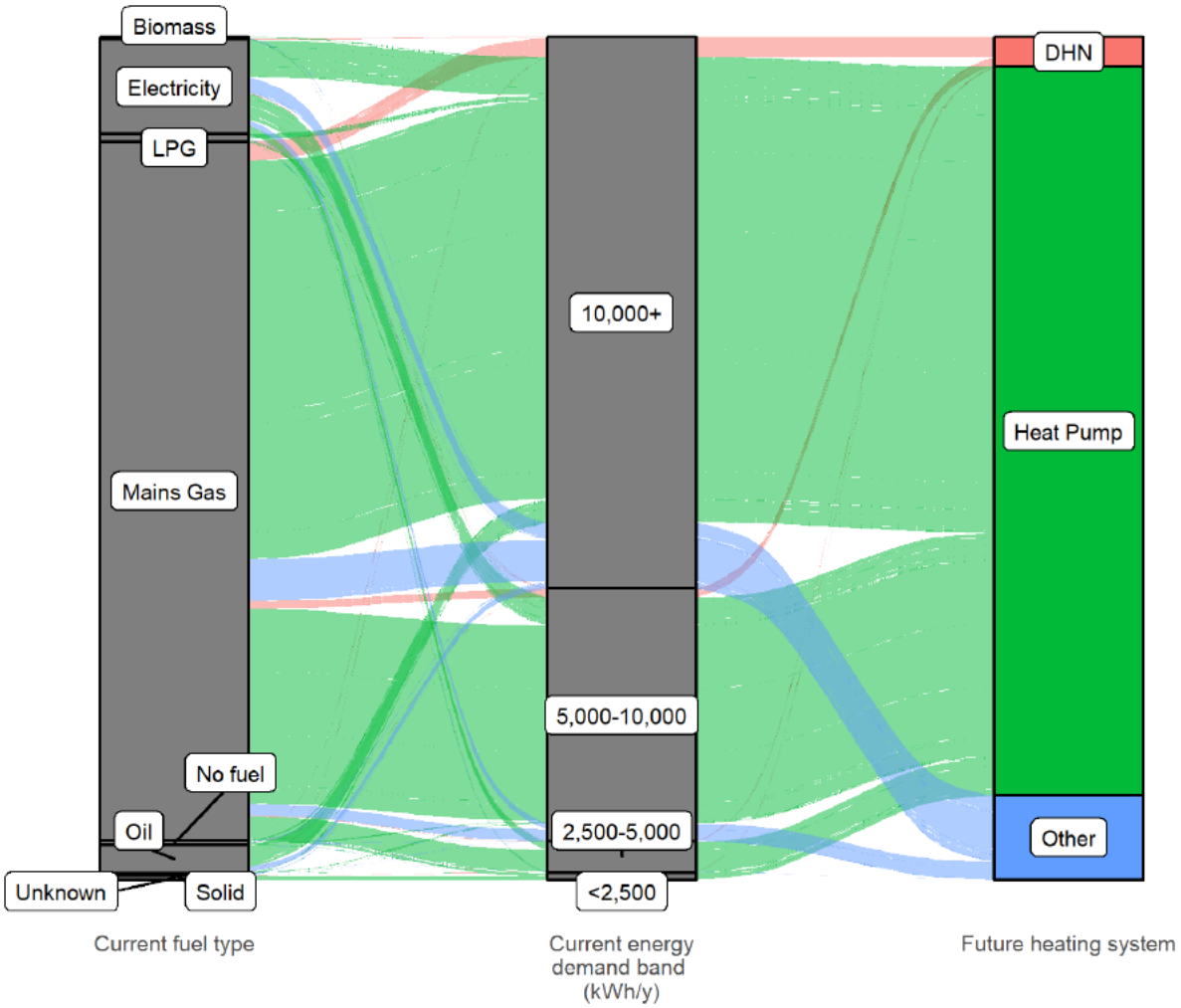


Figure 40 builds on this by additionally showing the future energy demand of houses following installation of a low carbon heating solution but no energy efficiency measures.

Figure 40: Decarbonisation Pathway Without Energy Efficiency

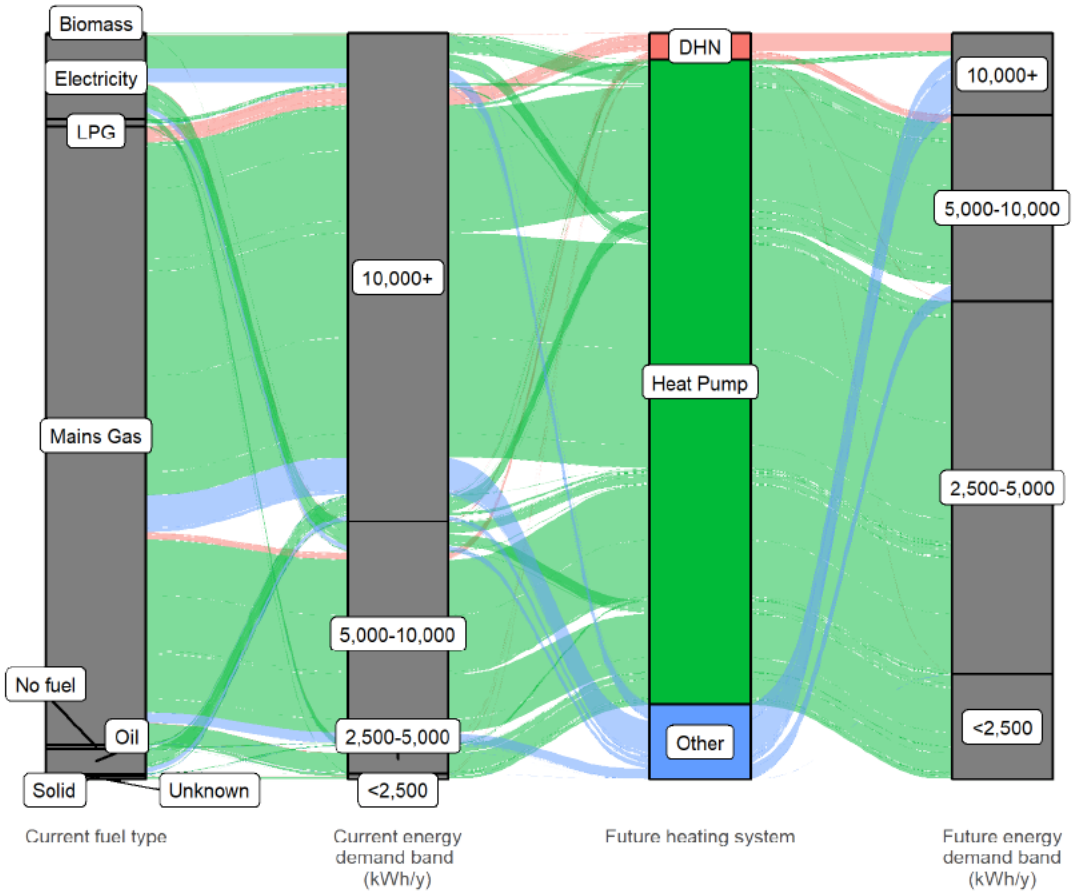
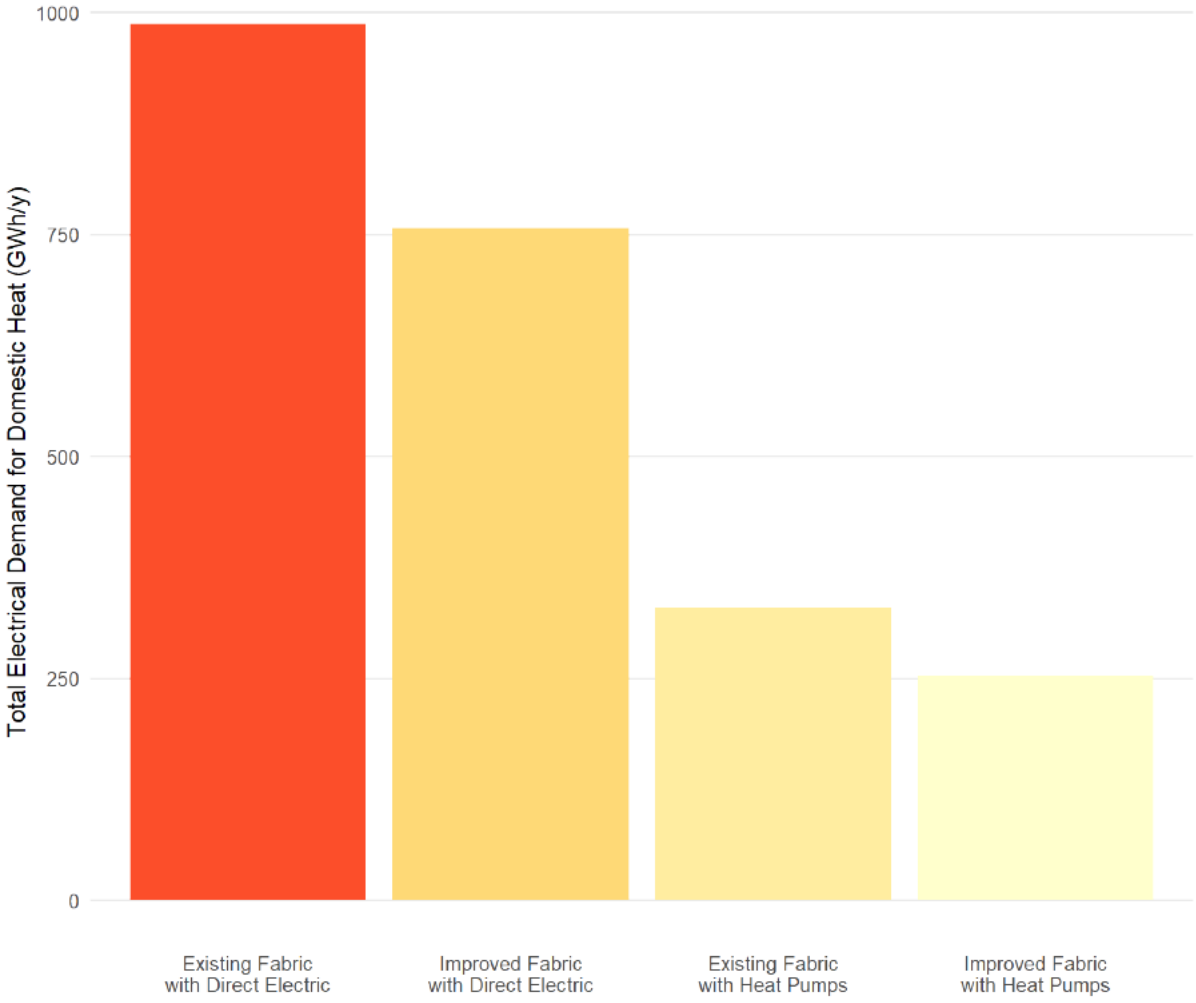


Figure 41 highlights the effect of heat pumps on the demand for electricity for heating, starting from a scenario where homes are switched to zero carbon electric heating as a baseline. Heat pumps on their own result in a larger reduction in energy demand than fabric measures on their own and, in combination, the fabric measures make only a minor improvement to homes with heat pumps. It should be noted that fabric measures help with making heat pumps feasible.

Figure 41: Total Electricity Demand Reduction by Measure



10.1.1 Fuel Poverty

The above steps will result in reduced energy demand as depicted in Figure 42. All the homes in North Ayrshire are grouped into bands of energy demand and it can be seen that improving the building fabric shifts homes down to lower bands. The installation of heat pumps shifts even more homes down, although the use of direct electric heating does not.

Figure 42: Shifting Energy Demand by Fabric Improvement and Heat Pumps.

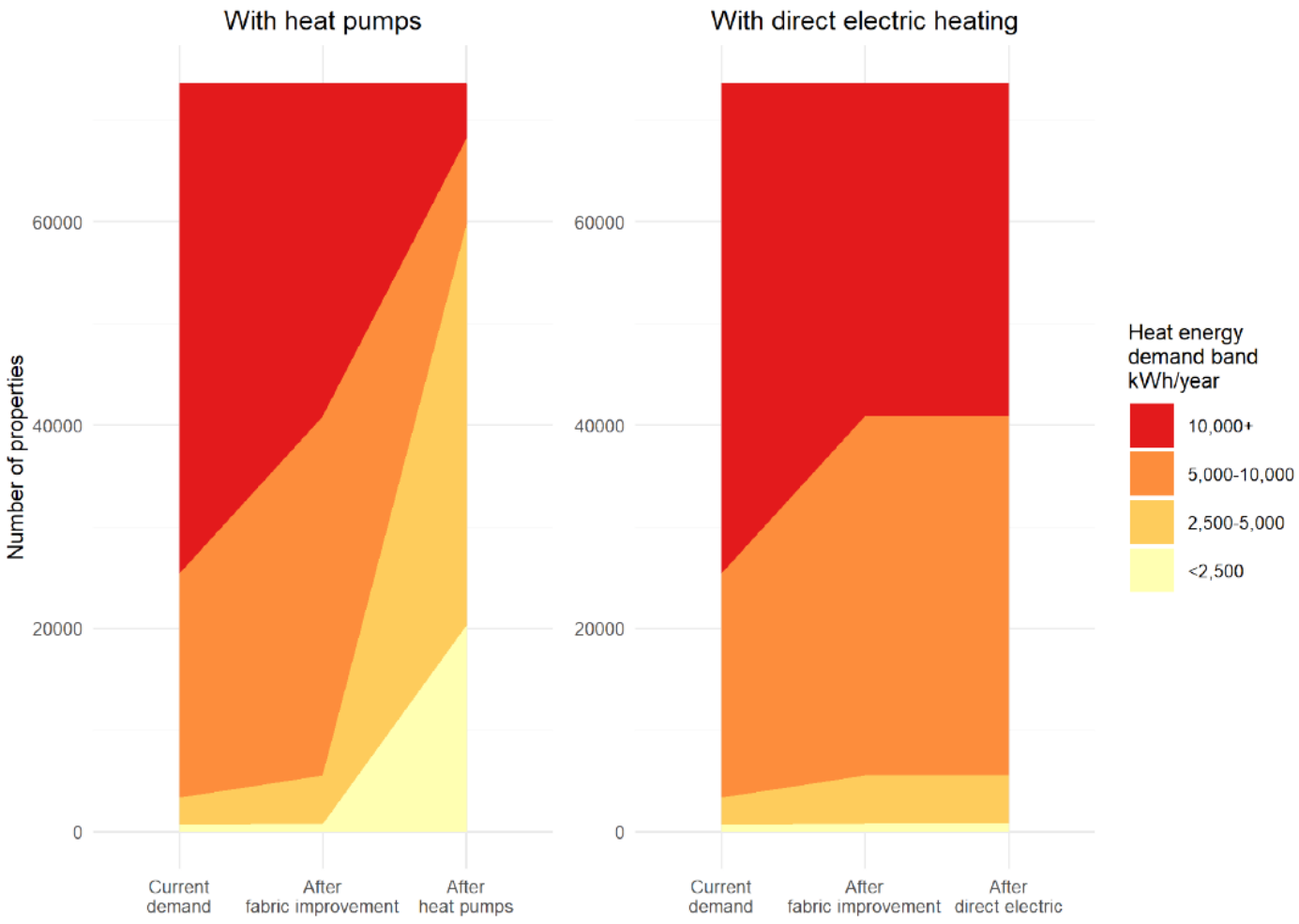
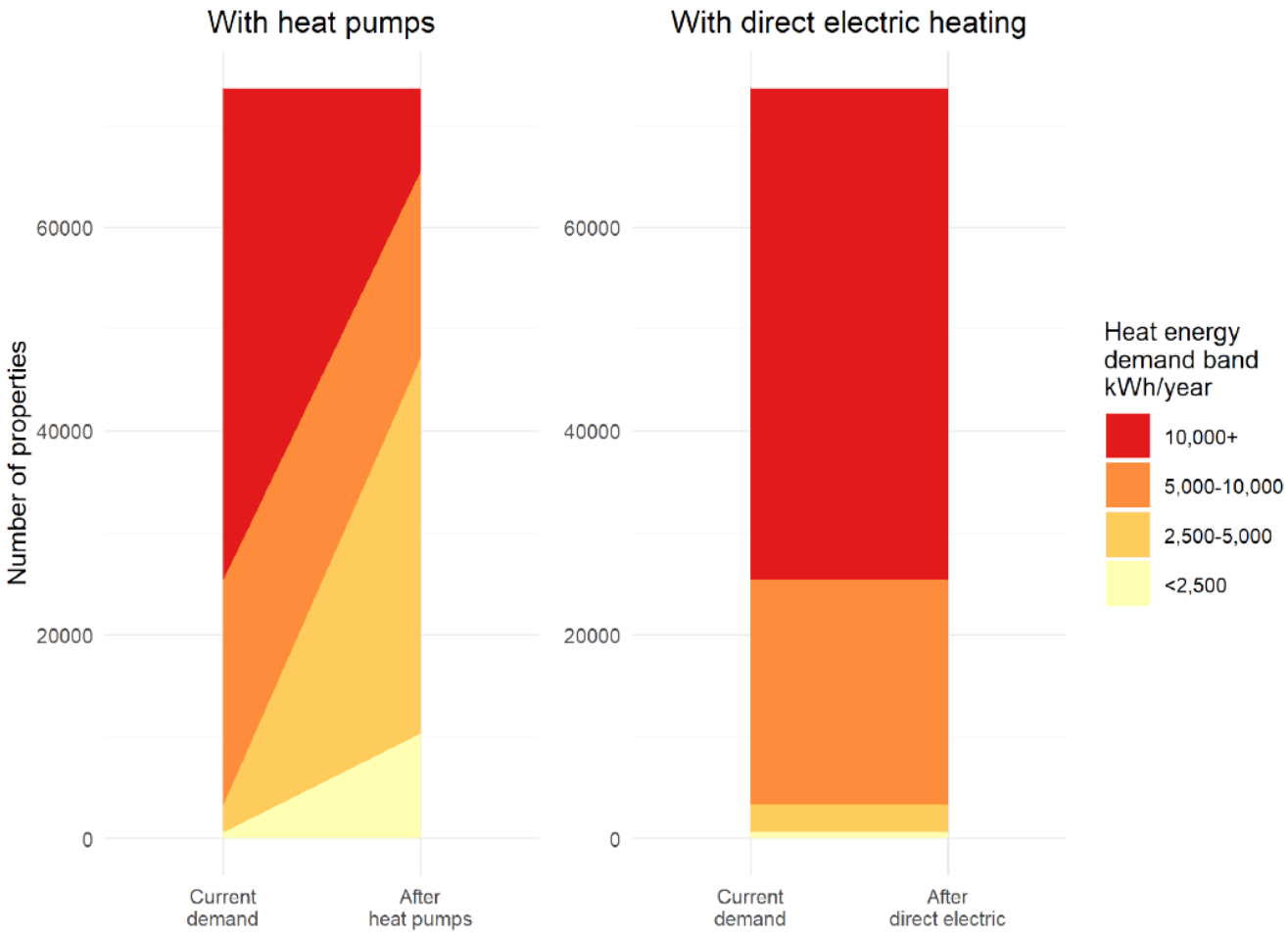


Figure 43 shows the consequence of the low carbon energy source alone, without other energy efficiency improvements on the number of units of energy that each property has to purchase. We can see that there are significantly fewer high consuming properties and more lower consuming properties with heat pumps. If electricity prices are equal between heat pumps and electric heating, there would therefore be significantly lower risk of fuel poverty in those properties.

Figure 43: Comparison of Energy Consumed Between Heat Pumps and Electric Heating



Reducing the heat demand of the buildings through installing energy efficiency measures is clearly important as it can reduce both the demand for heat and the remaining heat to be decarbonised, hence reducing the cost for those at risk of fuel poverty. This section looks at properties in the areas with the lowest Scottish Index of Multiple Deprivation (SIMD) data zones, to illustrate the combined effect of energy efficiency and low carbon heating on the amount of energy that the household would have to pay for, to fully heat their home. The cost of that energy would then affect their bills and contribute to whether they were in fuel poverty.

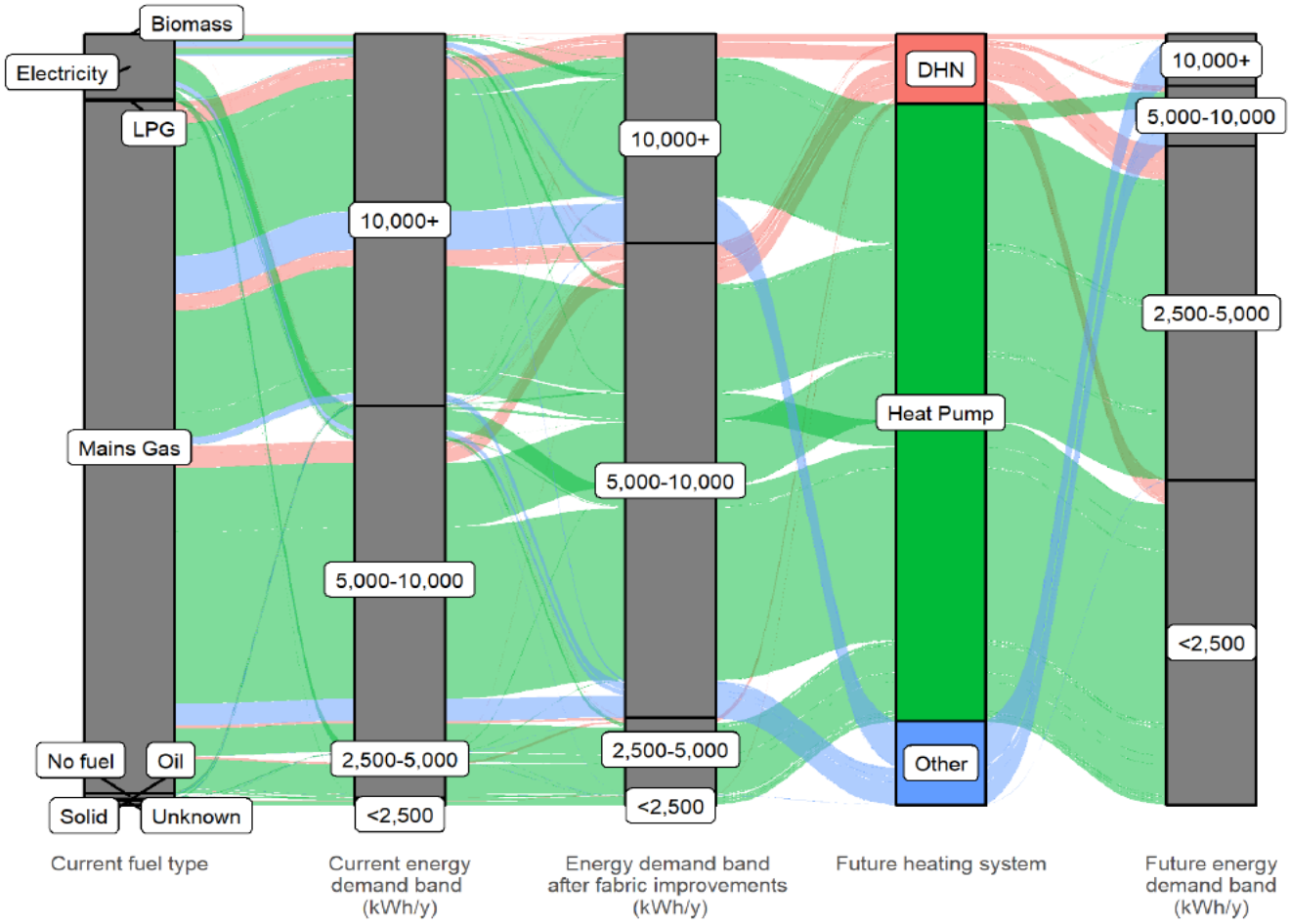
Figure 44 shows all properties in areas which have a SIMD score of 1, the most deprived areas. This shows, the main heating fuel they use at present, the different ranges of properties' heating demands (in kWh) and the range of heat demands after energy efficiency measures are installed.

Installing energy efficiency measures only significantly reduces the number of properties with heat demands of over 10,000 kWh per year. The majority of properties would end up with heating demands of between 5,000 kWh and 10,000 kWh per annum.

The properties are then allocated the most cost-effective low carbon heat source and the resulting energy consumption is shown on in the final column.

The cost of heat is determined on the fuel and specific tariff which is made up of several fixed and variable (demand led) parts.

Figure 44: Effect of Actions in all Properties in SIMD 1 Areas – Energy Efficiency and Heat Pumps

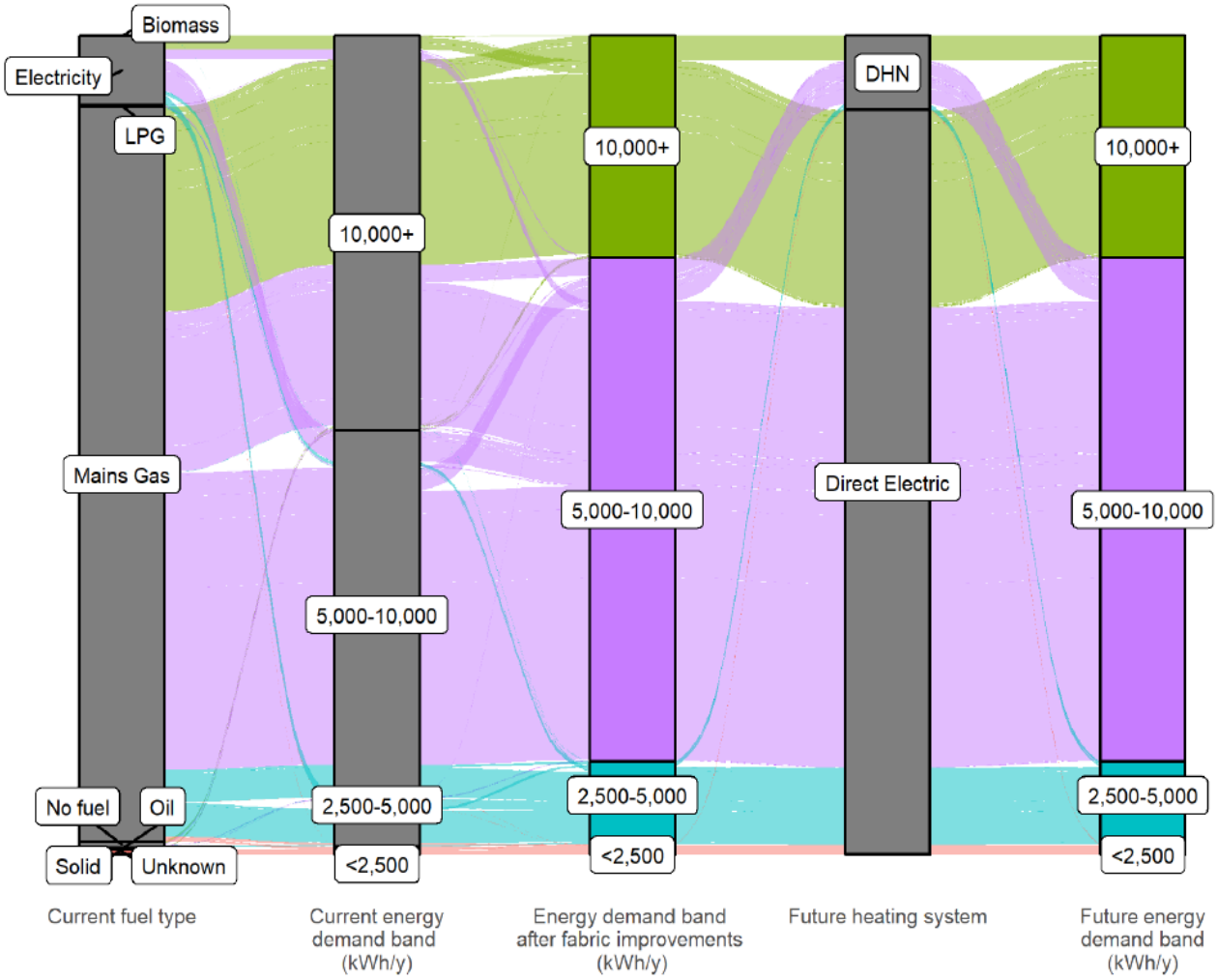


For houses where Heat Pumps or District Heat Networks (DHN) are not viable, and direct electric heating may be preferred (other), it can be seen that the majority of these houses remain in the high consumption bands of 5,000-10,000 and 10,000+ kWh. Whereas, where Heat Pumps can be installed, future energy demand drops across the board with most houses falling into the lower two categories 2,500-5,000 kWh and <2,500 kWh. This is because heat pumps output more energy as heat than the amount of electrical energy they consume, as they use electricity to upgrade naturally occurring heat from the environment. This allows Heat Pumps to reach efficiency levels above 100%, regularly operating at 300% efficiency[26], illustrating why heat pumps are the preferred option over direct electric heating where possible. This is further shown in Figure 45 where the distribution of houses' energy demand following energy efficiency measures and installation of direct electric heating is shown.

There may be differences in the electricity tariffs between these scenarios which would need to be considered in any direct comparison of options for a specific intervention. However, for the purposes of this Strategy, heat pumps are considered the preferred solution to minimise fuel poverty, in properties where district heating is not an option.

[26] Heat pumps (parliament.uk)

Figure 45: Effect of Actions in All Properties in SIMD 1 Areas – Energy Efficiency and Electric Heating



Other factors

There are several factors which affect fuel poverty and outlining the effect of energy efficiency measures in improving fuel poverty is complex. Household income after housing costs has a significant effect but is out of scope of this Strategy.

10.1.2 Unheated Homes

The Scottish Housing Condition Survey 2019[27] states

23% of fuel poor and 28% of extreme fuel poor say that their heating keeps them warm enough in winter "only sometimes" or "never",

For these households, reducing the heat demand through insulation measures both reduces how much it would cost them to heat their home as well as limiting the temperature to which the property will fall in any periods when they do not or are unable to heat it. For those at highest risk of not heating their homes, the decision whether to focus capital spend on additional insulation measures or lower cost heating systems is therefore complex.

[27] 5 Energy Perceptions - Scottish house condition survey: 2019 key findings - gov.scot (www.gov.scot)

Actions on Poverty are a key focus for North Ayrshire Council. Recent and ongoing actions include:

- The North Ayrshire Child Poverty Strategy covering the period 2023-26 [28][29]
- The North Ayrshire Child Poverty Report 2022-23
- The North Ayrshire Child Poverty Action Plan 2023-24
- Support through cost-of-living crisis[30]
- Council targets on Percentage of Children in Poverty and households in fuel poverty are set out in The Council Plan Progress Update[31]

With insulation measures, there are a range of measures which have different costs and energy reductions and there is no single approach suitable for all buildings or situations. The North Ayrshire Council LHEES Delivery Plan outlines the various considerations to support insulating properties.

10.2 Heat Networks

Heat networks have a role to play in the future of heat in North Ayrshire. Heat networks can be either district heating schemes which are strategic scale developments where multiple buildings are connected, smaller heat networks, within a single campus, or communal heating systems in a specific building. Within this Strategy, the heat networks referred to are district heating schemes where multiple buildings are connected by pipework. Potential heat networks across North Ayrshire for different scenarios are shown in Appendix D.

There are a number of areas which may prove suitable and where there are the conditions to warrant further investigation. The area in the centre of Irvine (Figure 22, Area 2), has a significant total heat load, a number of anchor loads of diverse types and is in close proximity to areas of fuel poverty and has a number of significant heat loads in the wider area which could be considered at feasibility stage. The suitability of the individual buildings for connection to heat networks is not known and would need to be confirmed through Building Assessment Reports (BARs)[32], site investigation and engagement with stakeholders.

Even in the zones where heat networks are an option, there are differences between the domestic properties which are most likely to be suitable, blocks of flats, and properties which are less likely to be suitable such as detached houses[33].

Therefore, due to both the limited proportion of properties in areas where heat networks are likely to be viable and there being properties unlikely to be suitable for connection, it is essential that the Strategy considers other low carbon heat sources in parallel.

This does not preclude heat networks being developed to their full potential and it may be that a phased approach to heat networks and district heating could see smaller networks initially focus on the most viable properties with further expansion at a later time.

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[28] Cabinet paper 13/06/2023

[29] Council's strategy to improve life for children living in poverty is revealed (north-ayrshire.gov.uk)

[30] North Ayrshire Council continues its tireless work to help residents through the Cost-of-Living Crisis (north-ayrshire.gov.uk)

[31] Council Plan Progress Update - Year End 2021-22 (north-ayrshire.gov.uk)

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

[33] 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.

10.3 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 majority of buildings. Heat pump deployment, and the role they play in decarbonising buildings must lead to a cost of heat that is equivalent with natural gas boilers and the user experience of operating the systems has to be positive. There are examples of people having bad experiences living with heat pumps and while there are many good experiences, it is essential to understand what is required for heat pumps to meet the needs of people in North Ayrshire.

Other solutions

While heat networks and heat pumps are considered the most preferable of the available solutions, North Ayrshire Council recognise that there is a wide range of user experiences with these technologies. For all technologies it is important that they meet the requirements of all parties, particularly those in fuel poverty or at risk of fuel poverty.

It is for each property owner to make their own decision on the heating system they prefer and there is a role for North Ayrshire Council in ensuring that accurate and up-to date information is available to households, tenants, landlords and owner occupiers to support decision making. This is likely to include signposting to national advice schemes operated by the Scottish Government or UK Government.

In order to ensure that the heat pump systems installed are of good quality and perform as expected, the sharing of good practice and case studies is emphasised.

North Ayrshire 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.

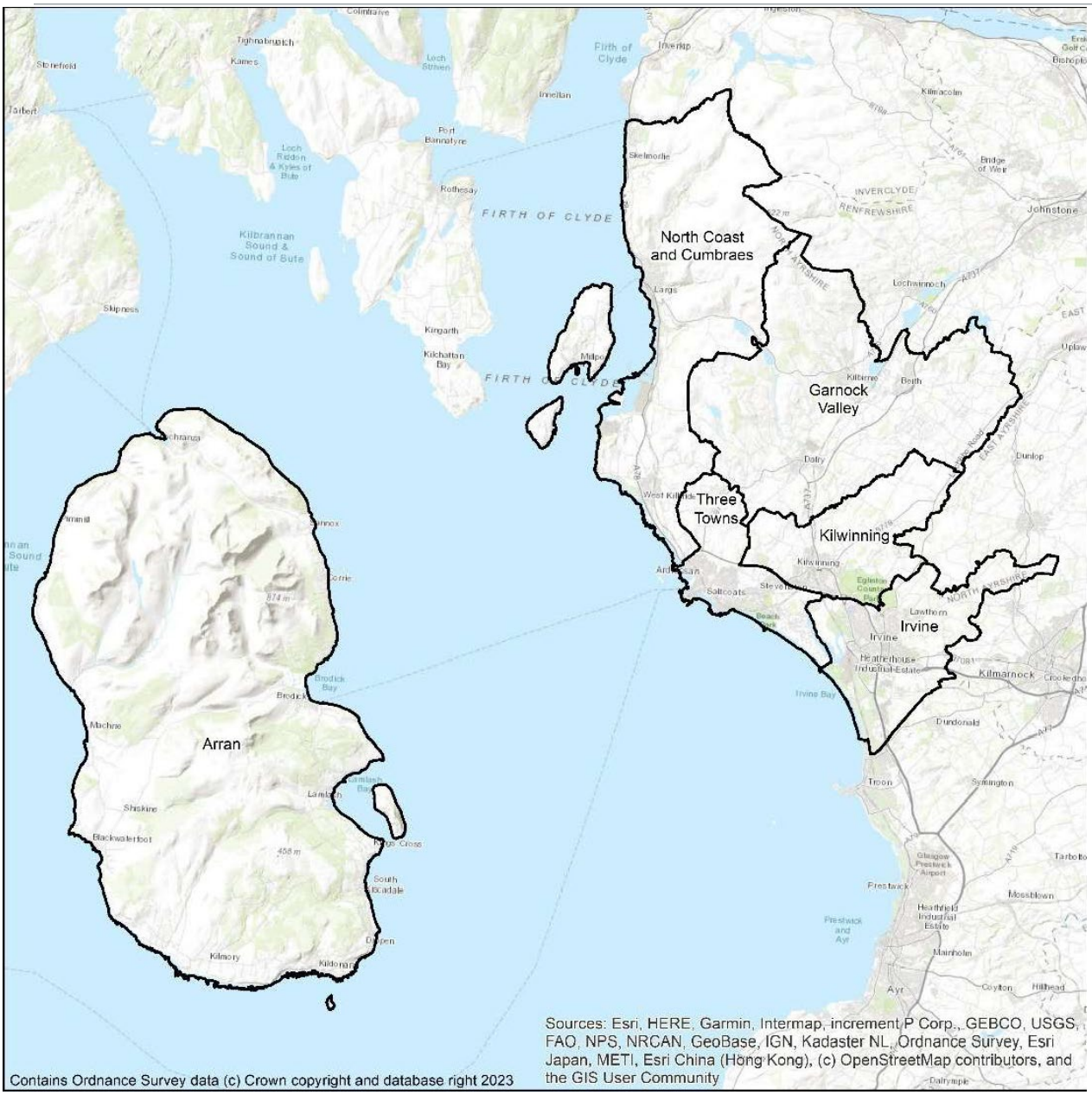
It is essential that there is a supply chain which is capable of installing the technologies set out above. North Ayrshire Council will work to consider what actions the Council could take to encourage a local supply chain of low carbon heating installers.

Finally, for any new technology, ensuring quality of installation is important to confirm that it meets the needs of households, tenants and property owners. The Council will work with stakeholders to identify any role that North Ayrshire Council can play in ensuring the quality of installations as well as referring to national schemes such as the Microgeneration Certification Scheme (MCS).

11.1 Strategic Zones

North Ayrshire Council has six localities (Figure 46) which are used for the purposes of LHEES As the Strategic Zones. The six Localities or Zones are Arran, Garnock Valley, Irvine, Kilwinning, North Coast and Three Towns.

Figure 46: Strategic Zones



11.2 Arran

The Isle of Arran represents a large geographical area within North Ayrshire, but it has the smallest number of properties at 3,778, leading to a low heat demand density. Along with Cumbrae, the population of Arran meets the Scottish Government's definition of 'remote rural', "settlements of less than 3,000 and with a drive time of over 30 minutes to a settlement of 10,000 people or more".

The anticipated decarbonisation pathway for Arran is shown in Figure 47. It shows that a combination of energy efficiency measures can reduce demand significantly, however, there remain properties which will either need energy efficiency measures which are less cost effective or will continue to have relatively high heat demands.

The technology which is currently available and is suitable for most properties is heat pumps, however there are a significant number of properties where alternative solutions such as electricity or biomass may be required.

Figure 47: Decarbonisation Pathway for Domestic Properties on Arran

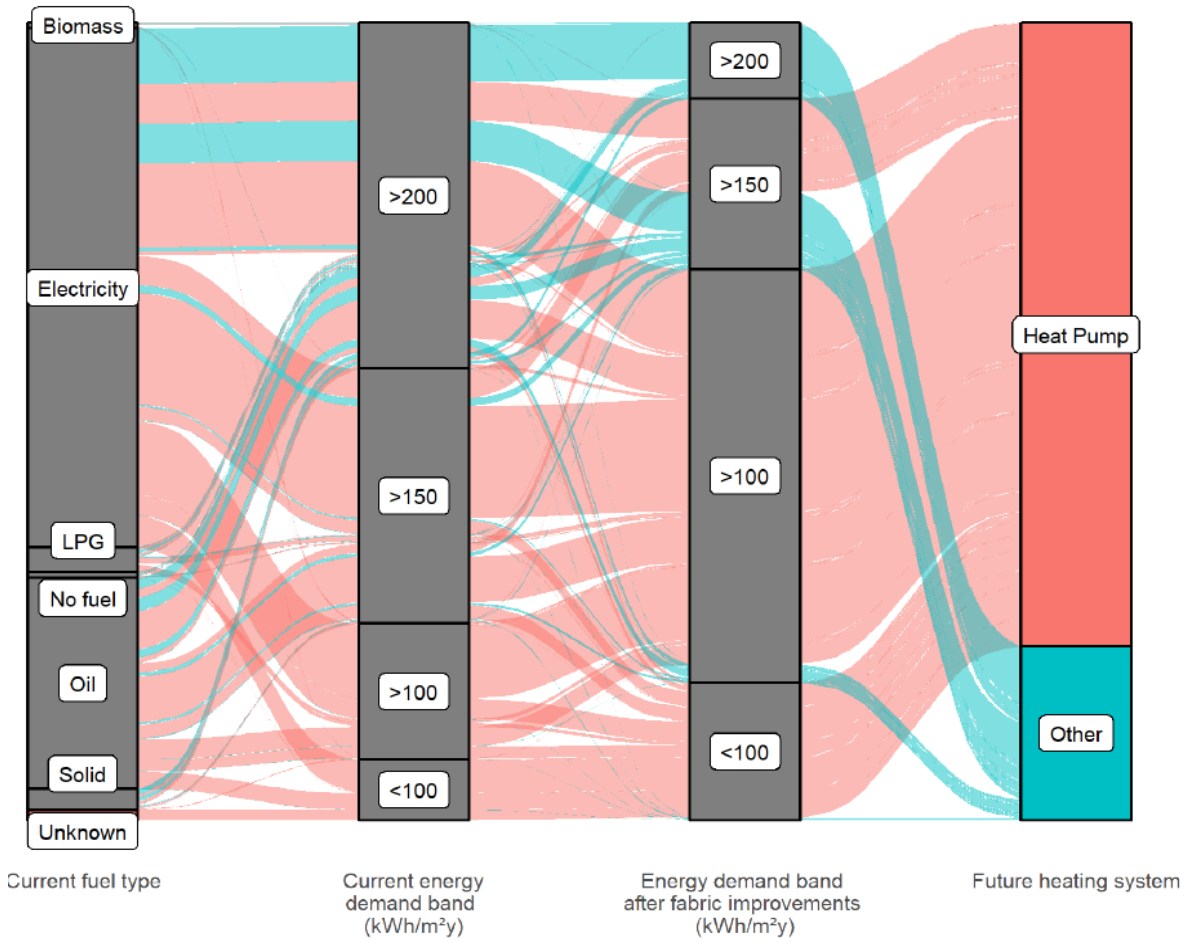


Figure 47 shows all domestic properties within Arran, which heating fuel they use at present, the heating energy demand of the property per area (kWh/m^2), a measure of energy efficiency, which is more relevant to assessing heating systems than the EPC rating would be. It then shows the energy efficiency after the addition of reasonable energy efficiency measures to each property and finally the most suitable technology for each property at present.

There remain more properties on Arran with high heat demands than other areas as the buildings are less suitable for insulation measures than in other areas. While there remain

a significant number of properties with high heat demands and therefore less suitable for heat pump installations, some of these high demand properties already have heat pumps, suggesting that there is an experienced supply chain servicing the area and that it may be possible for a greater proportion of properties to have heat pumps than estimated.

11.3 Garnock Valley

The Garnock Valley locality consists of mostly on-gas grid properties away from the coast with the majority of the 20,128 population residing in the small towns of Kilbirnie, Beith and Dalry.

Figure 48: Decarbonisation Pathway for Domestic Properties in the Garnock Valley

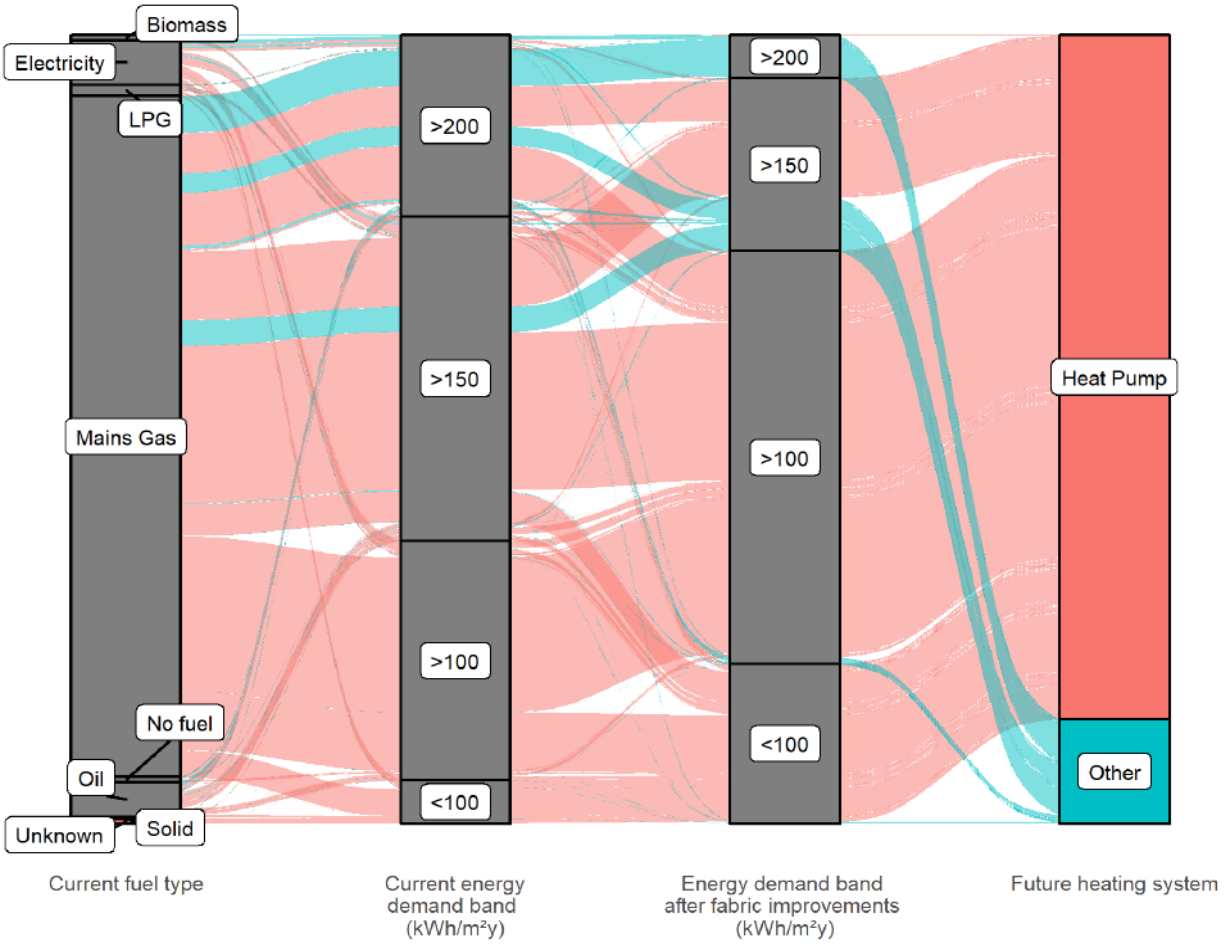


Figure 48 shows all domestic properties within the Garnock Valley, which heating fuel they use at present, the energy demand of the property per area (kWh/m^2), a measure of energy efficiency, which is more relevant to assessing heating systems than the EPC rating would be. It then shows the energy efficiency after the addition of reasonable energy efficiency measures to each property and finally the most suitable technology for each property at present.

As with most areas in North Ayrshire, heat pumps are the low carbon heating solution suitable for the greatest number of properties. There remain a small proportion of properties with relatively poor energy efficiency (more heat used per area of property).

11.4 Irvine

Home to the largest population at 39,517 Irvine is also the largest locality in terms of number of properties at over 19,000. Although the locality extends inland to a larger area beyond

the town, most of the population and properties within this locality are in the town itself which serves as the major employment and administrative centre in the local authority area.

Due to Irvine having a relatively high population density as well as some key anchor loads visible in the Scottish Heat Map as well as a number of Council owned properties, this locality represents one of the greatest opportunities for potential future heat networks.

Figure 49: Decarbonisation Pathway for Domestic Properties in Irvine

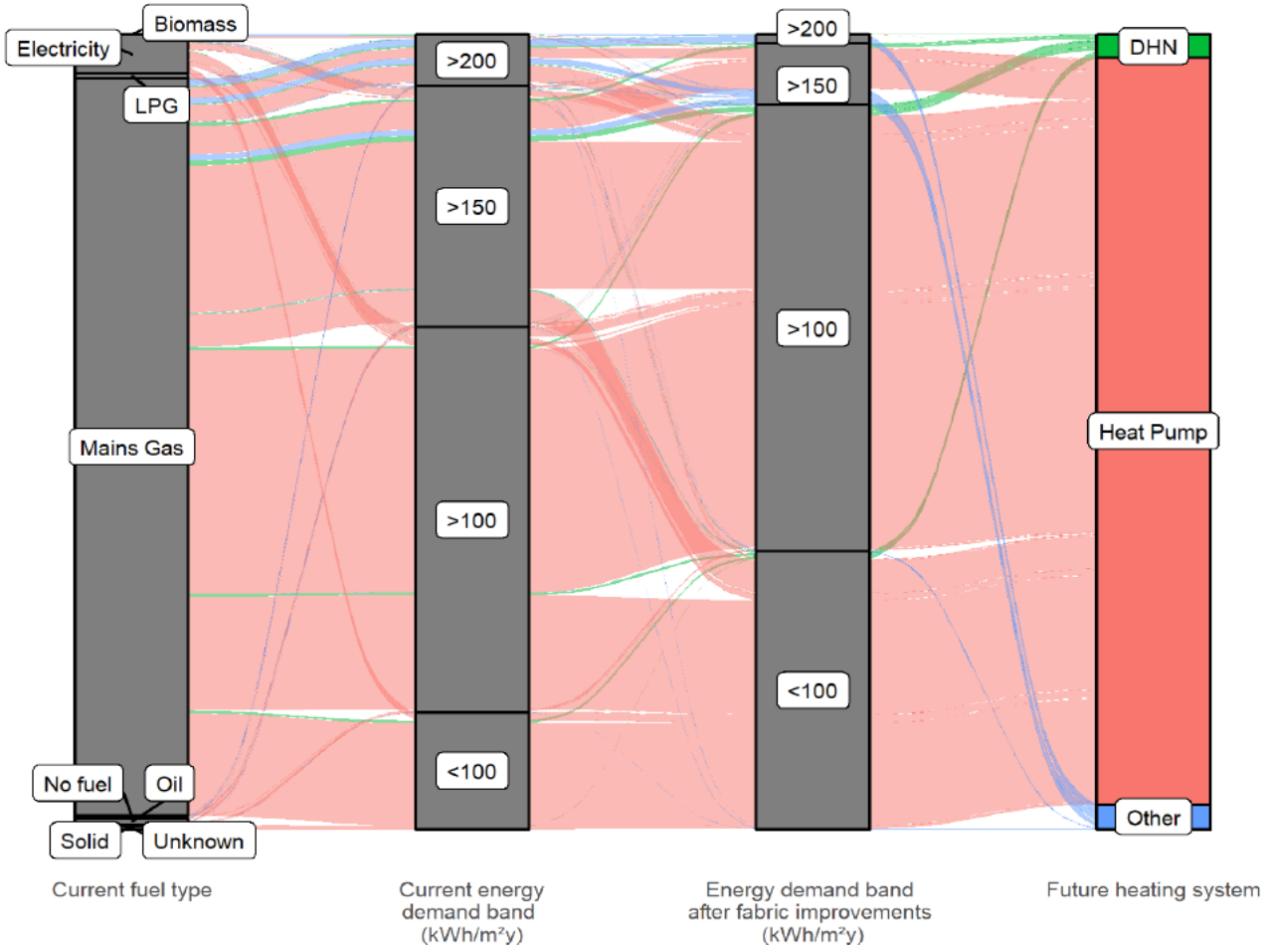


Figure 49 shows all domestic properties within Irvine, which heating fuel they use at present, the energy demand of the property per area (kWh/m^2), a measure of energy efficiency, which is more relevant to assessing heating systems than the EPC rating would be. It then shows the energy efficiency after the addition of reasonable energy efficiency measures to each property and finally the most suitable technology for each property at present.

The proportion of domestic properties within district heat network areas is still small, however more detailed feasibility study may identify ways of increasing this proportion. A greater proportion of properties could achieve good levels of energy efficiency (less heat demand per area) than in the rural areas of North Ayrshire. This could contribute significantly to fuel poverty reduction.

11.5 Kilwinning

The Kilwinning locality comprises of the area around the town between the localities of Irvine and Garnock Valley. It can be noted that Kilwinning and Irvine localities share similar overall profiles relating to property data for domestic buildings and within the Council's sub-housing market areas are combined to form a single grouping.

Figure 50: Decarbonisation Pathway for Domestic Properties in Kilwinning

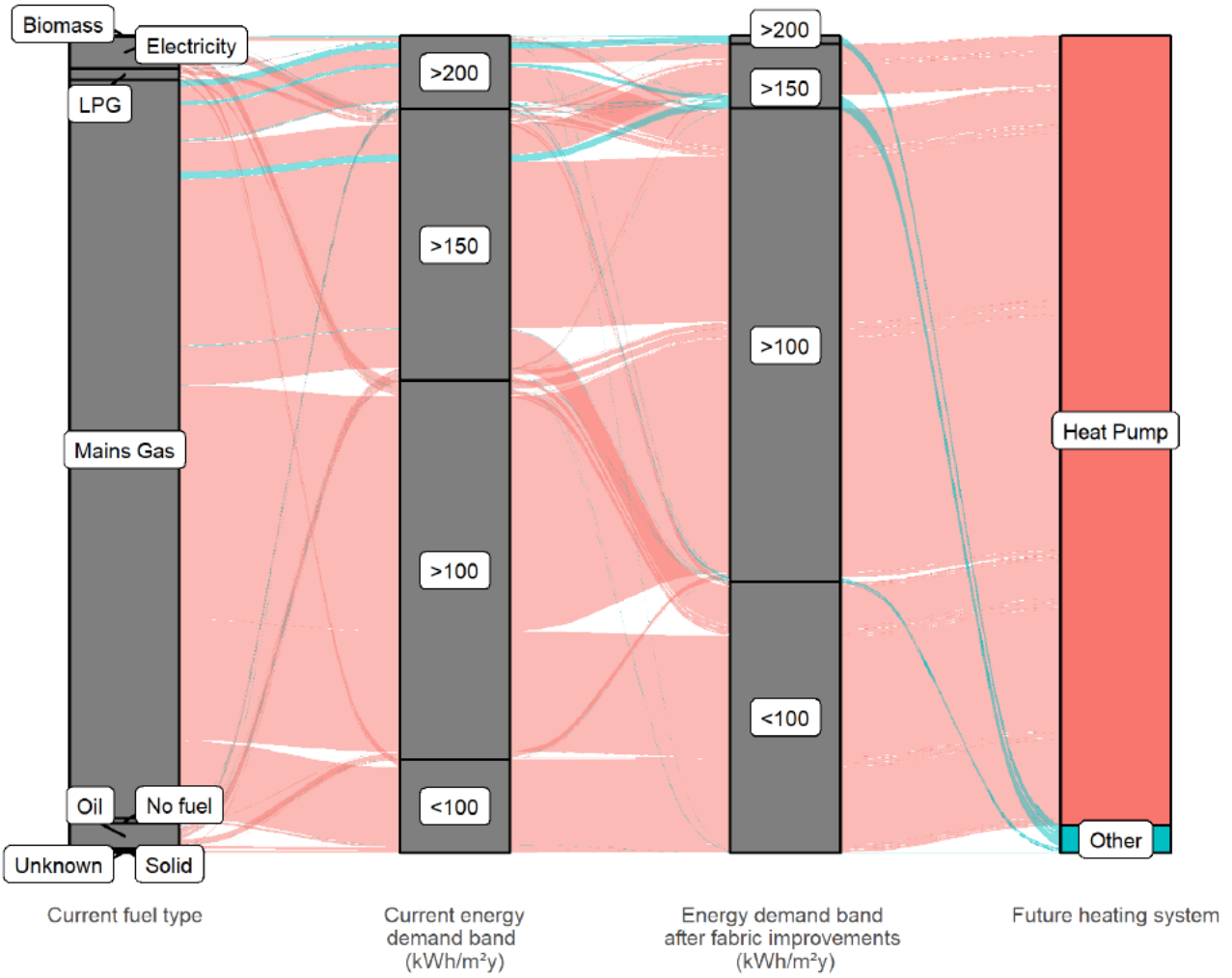


Figure 50 shows all domestic properties within Kilwinning, which heating fuel they use at present, the energy demand of the property per area (kWh/m^2), a measure of energy efficiency, which is more relevant to assessing heating systems than the EPC rating would be. It then shows the energy efficiency after the addition of reasonable energy efficiency measures to each property and finally the most suitable technology for each property at present.

In the Kilwinning area, most properties could achieve a good level of energy efficiency (low heat demand per area) and could use low carbon heating, although there are not significant district heating opportunities, so these are individual or communal heat pumps.

11.6 North Coast and Cumbraes

North Coast and Cumbraes locality is potentially the most diverse in terms of the types of properties represented. With the third highest number of properties at around 14,000 this locality consists of the coastal town of Largs, other smaller coastal villages in addition to the area inland as well as the Cumbraes. The North Coast and Cumbraes locality is noted for having an older population with high life expectancy and low crime figures, it should also be noted however that 23% of data zones fall within the top 15% access deprived in Scotland.

Figure 51: Decarbonisation Pathway for Domestic Properties in the North Coast and Cumbraes

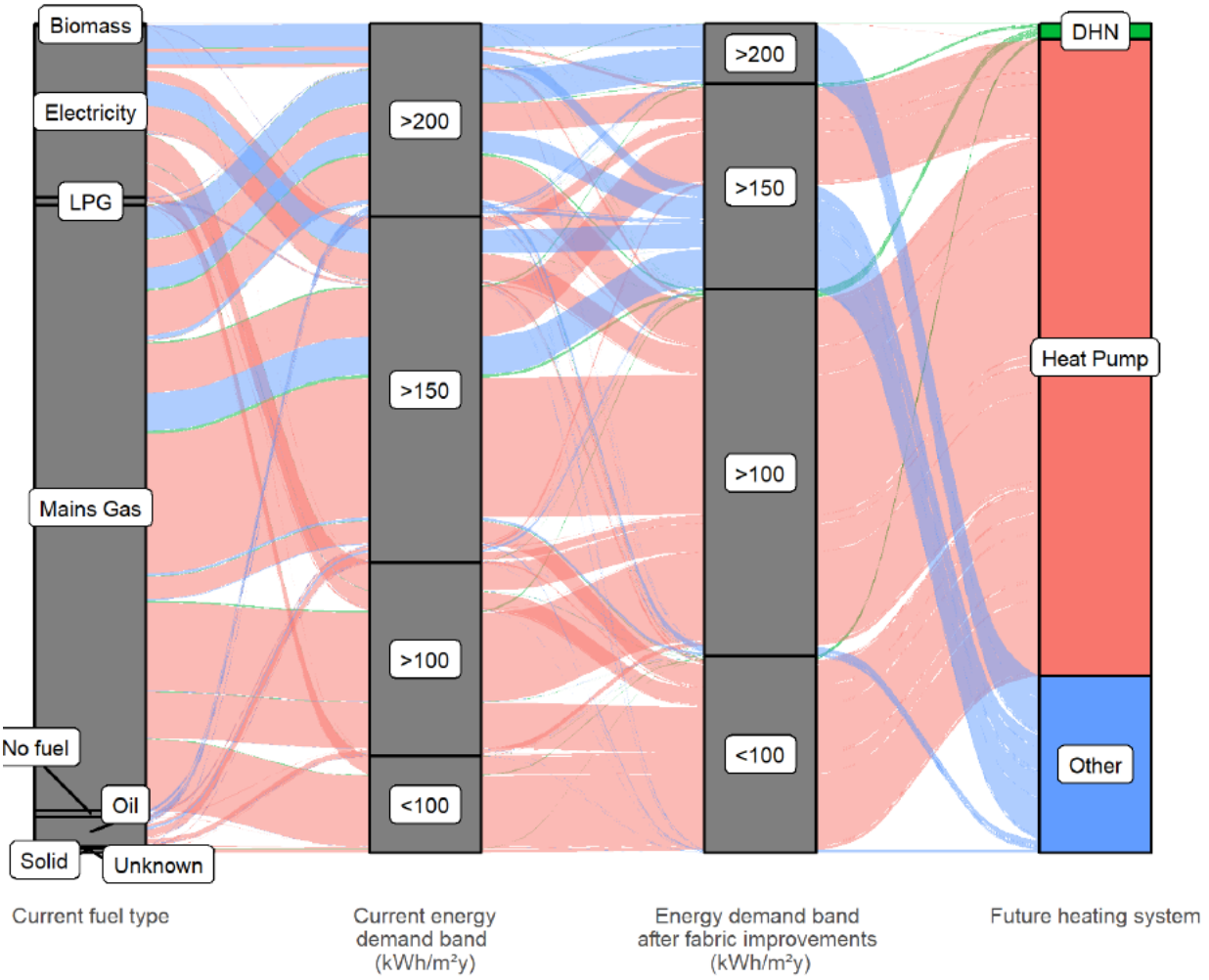


Figure 51 shows all domestic properties within the North Coast and Cumbraes area, which heating fuel they use at present, the energy demand of the property per area (kWh/m^2), a measure of energy efficiency, which is more relevant to assessing heating systems than the EPC rating would be. It then shows the energy efficiency after the addition of reasonable energy efficiency measures to each property and finally the most suitable technology for each property at present.

A significant proportion of properties in this area start with electric heating, more than other areas of North Ayrshire. The there are also a higher proportion of properties which continue to have relatively low energy efficiency (high heat demand per area) than North Ayrshire on average. There are a small number of properties in areas which are potentially suitable for district heating with communal or individual heat pumps being the most frequently suitable low carbon heating technology.

11.7 Three Towns

The Three Towns locality consists of the adjacent towns of Ardrossan, Saltcoats and Stevenston covering the surrounding coastal areas as well as some areas inland. Like Irvine and Kilwinning, most of the properties in the Three Towns are on-gas grid and are classified as being urban.

Figure 52: Decarbonisation Pathway for Domestic Properties in the Three Towns

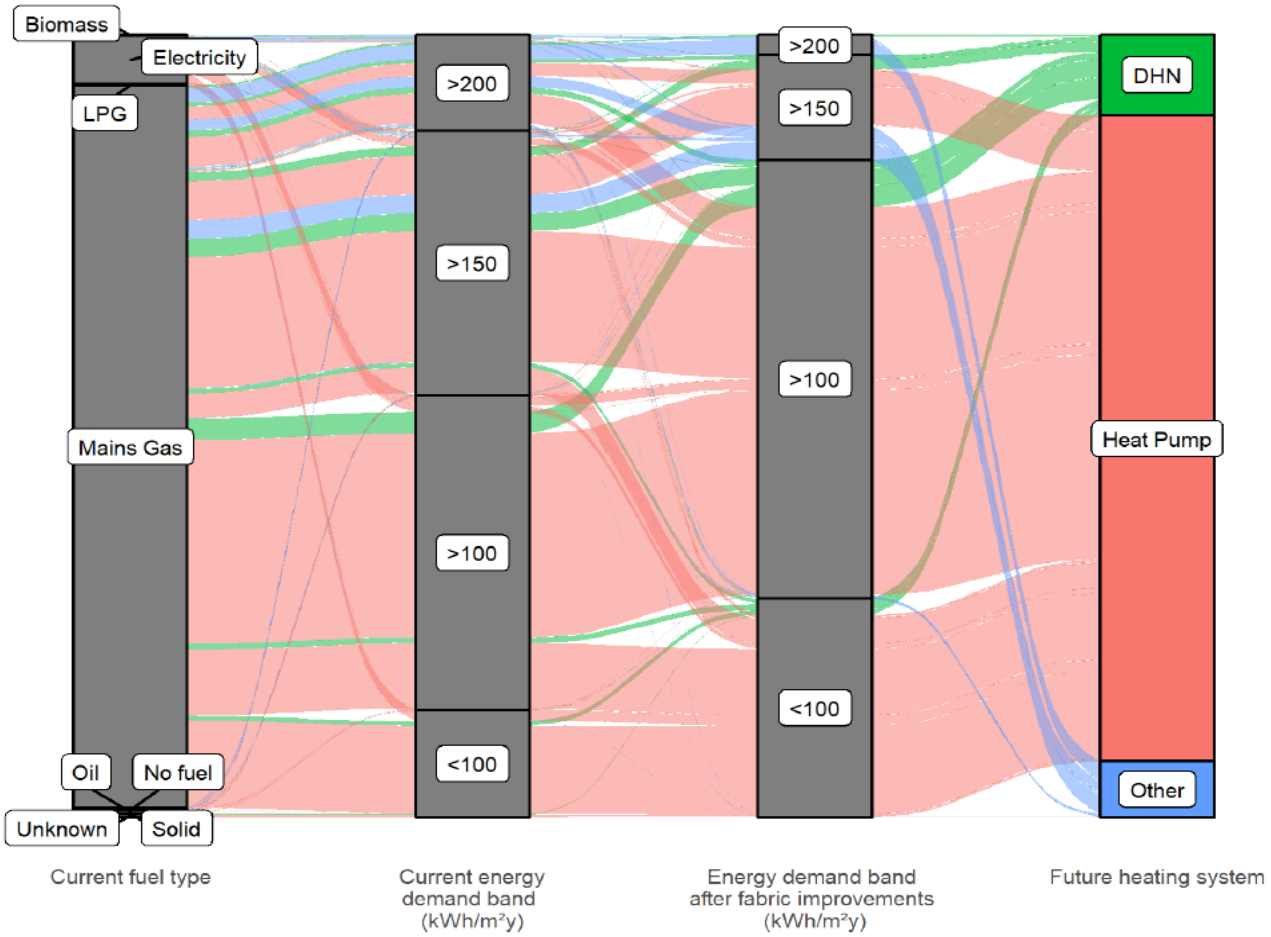


Figure 52 shows all domestic properties within the Three Towns area, which heating fuel they use at present, the energy demand of the property per area (kWh/m^2), a measure of energy efficiency, which is more relevant to assessing heating systems than the EPC rating would be. It then shows the energy efficiency after the addition of reasonable energy efficiency measures to each property and finally the most suitable technology for each property at present.

The majority of properties in the Three Towns area are using mains gas at present, with oil, LPG and electric heating make up a minority of properties. The energy efficiency of the buildings in this area improves to the point that there are relatively few properties with poor energy efficiency after reasonable energy efficiency measures are installed. The vast majority of properties would then be suitable for heat pumps, either as individual properties or communal systems.

11.8 Non-domestic Properties

11.8.1 Overview of Properties to Decarbonise

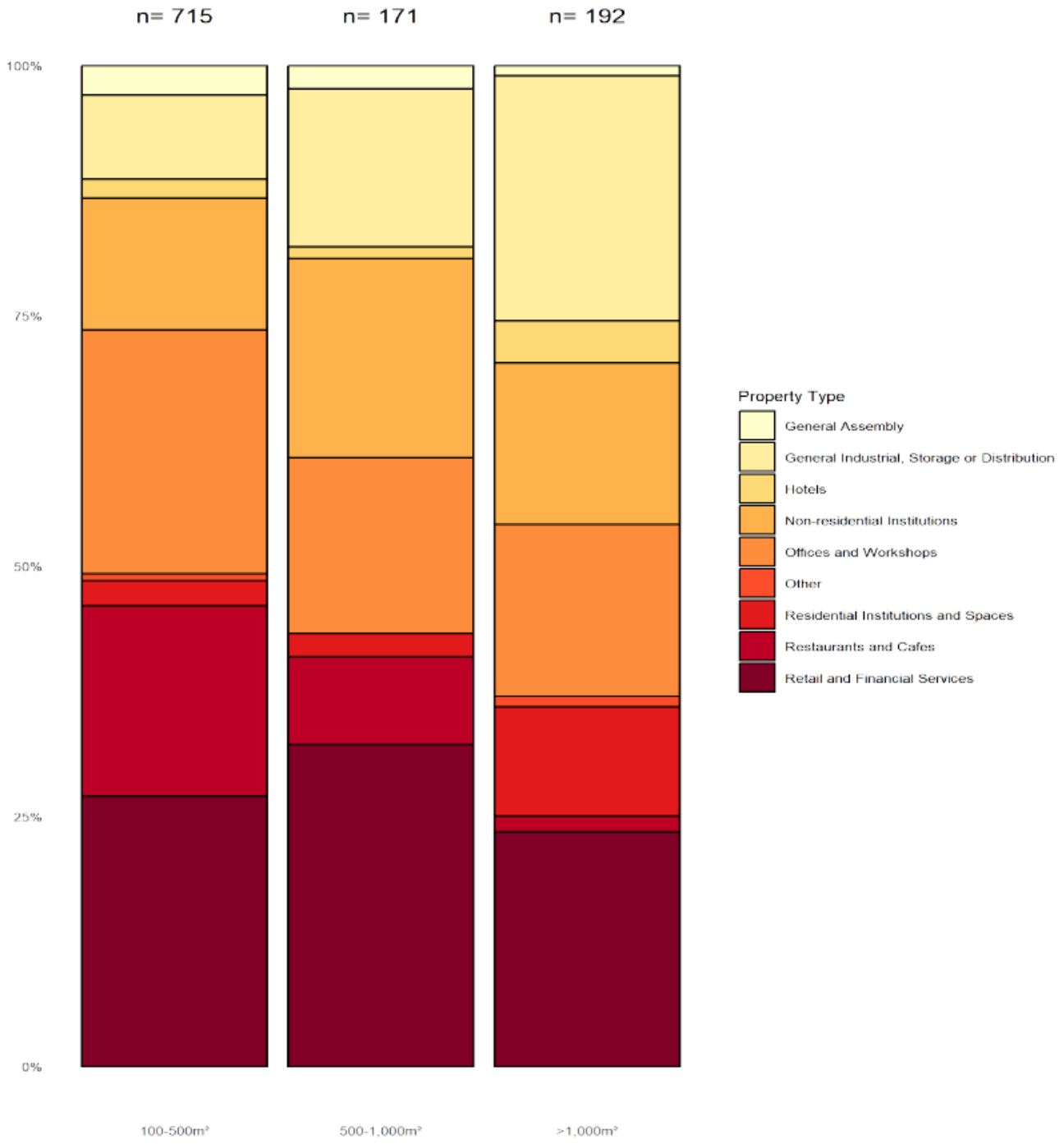
The most important action is to gather further data on the proportion of non-domestic properties which use fossil fuels for heat, their energy consumption, location and the organisation's plan to decarbonise. This would allow future iterations of the Strategy to better understand what progress has been made and where further action is required.

The non-domestic stock was characterised in 7.1.2 and the following conclusions could be drawn:

- The majority of properties are heated by either electricity or gas (Figure 10) and electricity will eventually decarbonise itself.
- The majority of the smallest properties are heated electrically (Figure 11) and the remainder will likely suit small air-to-air-heat pump systems
- The majority of properties are either in the oldest or youngest age categories (Figure 11)

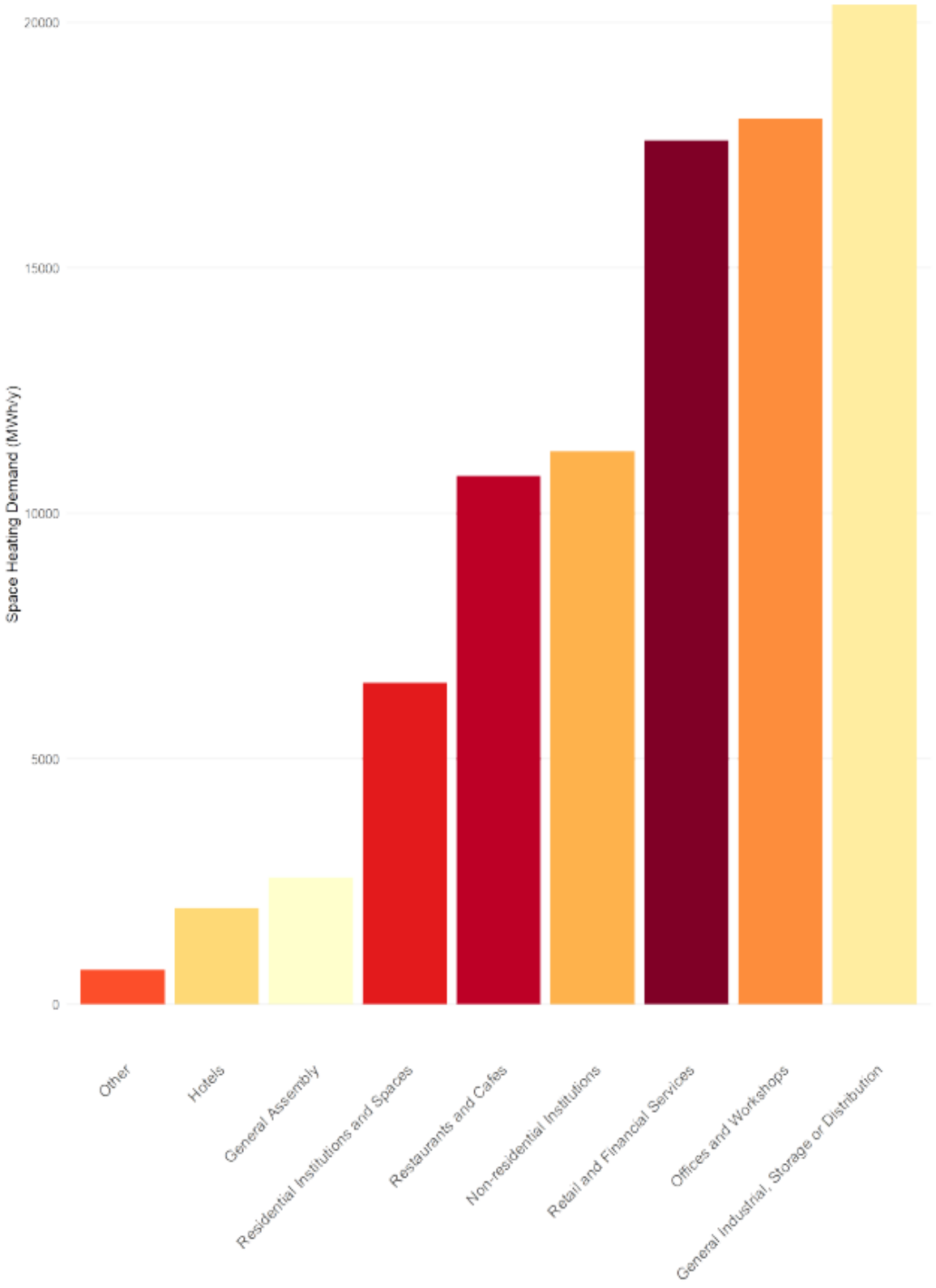
Strategically, the focus will be on gas-heated properties greater than 100m^2. Common building types in this category include Retail and Finance, Restaurants and Cafes, Offices and Workshops, and Non-residential Institutions (Figure 53).

Figure 53: Larger, Gas-Heated, Non-domestic Properties by Use Type



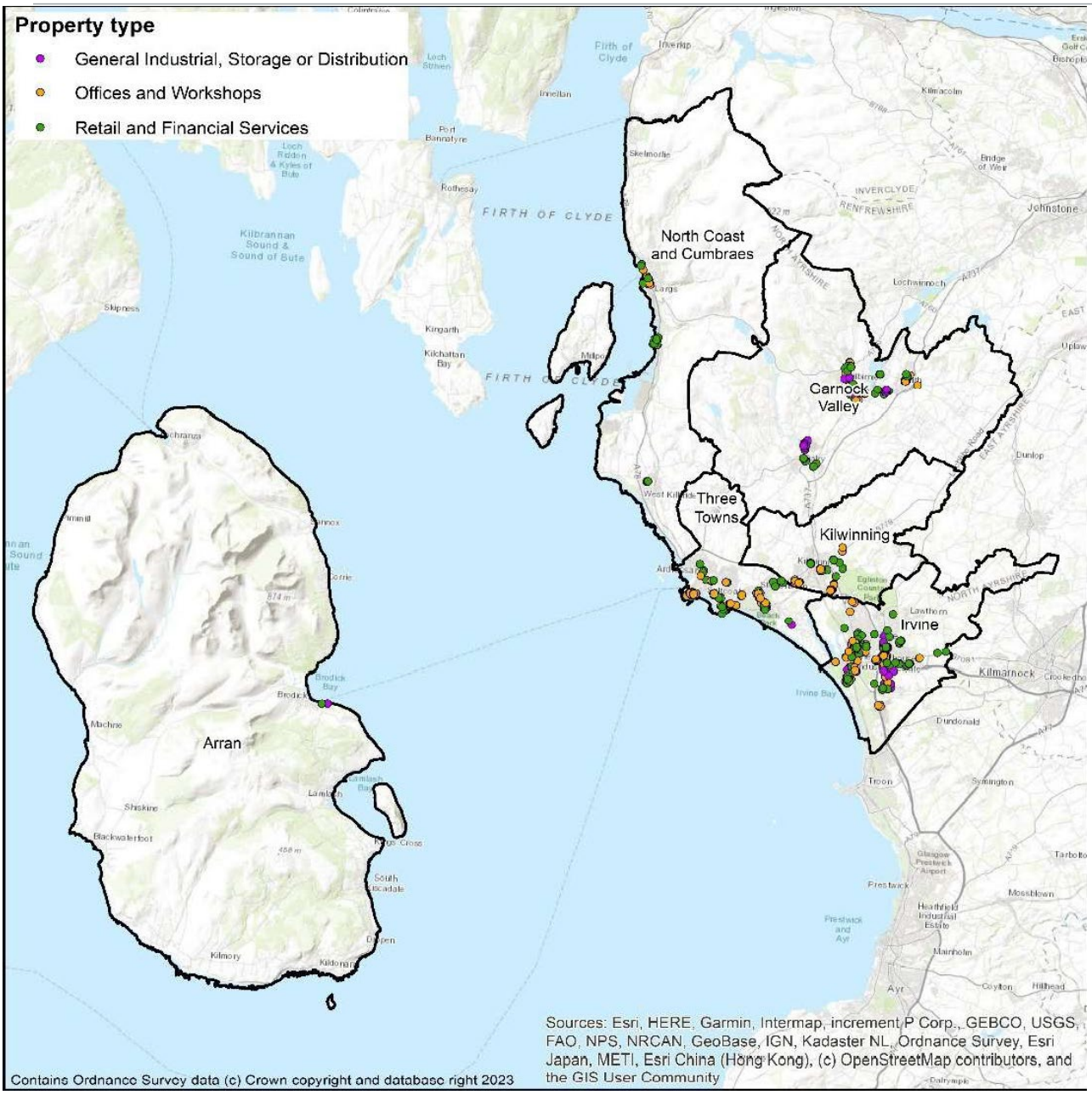
By estimated heat demand, 60% of heat demand is attributed to General Industrial, Storage or Distribution, Offices and Workshops, and Retail and Financial Services (Figure 54) so these should be the target of decarbonisation efforts. However, these loads are highly uncertain and validation of data is essential.

Figure 54: Space Heating Demand in Larger, Non-domestic, Gas-Heated Buildings by Type



These buildings tend to be urban and may find themselves in or adjacent to areas identified as potential heat network zone (Figure 55).

Figure 55: Map of Top Non-domestic, Gas-heated, Energy-consuming Building Types



The conclusions are caveated by the known discrepancies in the base data's estimate of heat demand.

11.8.2 North Ayrshire Council Portfolio

Considering the Council's Non-domestic buildings over 1000 m^2 in floor area, they are on their way towards decarbonisation Table 20. Around 44 % of floor area is either heated by biomass or electricity, leaving a little over half of the portfolio to be shifted from gas.

Table 20: Fuel Supply to the Council Properties over 1000 m^2

Fuel Type	Count of Buildings	Floor Area
Biomass	15	49,700
Electricity	12	13,300
Mains Gas	33	67,200
Oil	1	700
Totals	61	130,900

11.8.3 Heat opportunity area

As shown on Figure 22, the area to the South of Irvine, adjoining South and East Ayrshire has a number of industrial sites, areas allocated for development in LDP2. Due to the specific heat opportunities in this area, the Business Support and Development Team are actively working to support businesses in this area to support heat opportunities which have been identified by businesses and investors.

11.8.4 Support for businesses

The Business Support and Development Team continue to work with businesses to reduce their environmental impact. Key to this is supporting the development of opportunities to collaborate and adopt new and emerging technologies. Our support covers all areas of the green spectrum from awareness raising to innovative new projects, funding and cultural change. Local Heat Networks will continue to be promoted to business where opportunities exist.

12. Conclusions

The Strategy finds that there are technologies available now which would enable most of our buildings to be low carbon and use less heat. They can contribute to a reduction in fuel poverty, which can sit alongside the other actions that North Ayrshire Council are taking to reduce the rate and impact of poverty overall.

However, we are in a period of financial challenges and the transition cannot be fully funded by the Council. The funds that the Council has available will be prioritised to maximise the reduction of fuel poverty, using the information set out in this Strategy.

It will be for individual homeowners, businesses, landlords and tenants to decide what is best for them and their buildings. This Strategy seeks to understand which options are likely to be available for most buildings and which buildings are going to be harder to treat. This allows the Council to track progress, advocate for funding, identify stakeholders and consult with them to find out how these barriers can be overcome.

The targets the Council has been set for decarbonising heat and reducing fuel poverty are very challenging. This Strategy shows North Ayrshire Council's knowledge and ability to start to act in collaboration with the UK Government, Scottish Government and the people of North Ayrshire to solve these challenges and continue making progress.

Since LHEES are to be refreshed every 5 years and there is a fuel poverty target of 2040, there are approximately 3 LHEES periods prior to this date. The costs targeting the highest priority third of data zones in the first of these periods is set out in Appendix H. This will inform discussion on both targeting of areas and of budget discussions.

North Ayrshire Council will coordinate, though the LHEES Working Group where investments are being considered by the Council which could align with LHEES priorities or consider the findings of this Strategy.

North Ayrshire Council will take the following strategic approach to fulfilling the obligations of the LHEES:

1) Insulate buildings where practical.
2) Support development of district heating networks where they can provide reliable low carbon heat at a reasonable cost.
3) Encourage deployment of individual or communal heat pump systems which deliver reliable heat at a reasonable cost.
4) 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.
5) Work with businesses to develop their decarbonisation plans.
6) Support economic development and inward investment through identification of heat opportunity areas

Appendices

Appendices pertaining to the LHEES strategy document can be found on the Council's Energy Management website