Agenda Item No. 7(b)

South Ayrshire Council

Report by Assistant Director – Planning and Development to Cabinet of 16 January 2023

Subject: Local Heat and Energy Efficiency Strategy and Delivery Plan and Consultation

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1. Purpose

1.1 The purpose of this report is to seek Cabinet approval for the publication of a draft Local Heat and Energy Efficiency Strategy and Delivery Plan for public consultation for a period of 8 weeks.

2. Recommendation

2.1 It is recommended that the Cabinet:

2.1.1 approves the publication for public consultation of the draft Local Heat and Energy Efficiency Full Technical Report (Appendix 1) and Local Heat and Energy Efficiency Strategy Consultation (Appendix 2) for a period of 8 weeks; and

2.1.2 requests that officers take account of any responses and present a finalised Local Heat and Energy Strategy and Delivery Plan to Council on 27 June 2024 including recommendations for the membership, quorum and remit of a Member/ Officer Working Group to monitor and report annually on the implementation of this Delivery Plan.

3. Background

3.1 The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 places a duty on local authorities to prepare and update a Local Heat and Energy Efficiency Strategy (LHEES) and Delivery Plan. Asset Management have prepared documents to fulfil SACs duty under the Order. This Strategy has been developed in line with Scottish Government's (SG) methodology and sets out a long-term plan for decarbonising heat in buildings in the South Ayrshire area and improving energy efficiency.

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

3.2.1 Net zero emissions by 2045 and 75% reduction by 2030; and

3.2.2 In 2040, as far as reasonably possible, no household in Scotland is in fuel poverty.

4. Proposals

4.1 South Ayrshire Council's Draft LHEES Full Technical Report is set out in Appendix 1. The Draft LHEES sets out an analysis of heat demand in South Ayrshire's building stock inclusive of public and private sectors and encompasses domestic and non-domestic properties. It provides a profile of energy efficiency of these properties, considers measures of relative deprivation and population density. From this, it identifies possible interventions and pathways through which the South Ayrshire Council area can reduce fuel poverty and move decisively towards net-zero in line with local and national objectives. The Draft LHEES includes the following provisions:

4.1.1 Sets out how different types of building stock can change to meet national and local objectives, including the removal of poor energy efficiency as a driver of fuel poverty, and achieving zero greenhouse gas emissions in the building sector. The draft LHEES includes maps of all property types in South Ayrshire, providing this information at street level.

4.1.2 In order to achieve policy objectives (for example, net zero/ alleviating fuel deprivation) the most effective way of achieving these objectives is through connection to a heat network (also known as district hearing) However, connection to a heat network is only an effective option where there is sufficient heat demand and a suitable location for an 'energy centre' (a central heat source which may be ground, air or water heat pumps, but could also be an industrial plant which produces excess heat, former mineworking etc.).. This option is limited to highly concentrated areas and the draft LHEES identifies only parts of Ayr Town Centre, Heathfield and Girvan as being potential feasible areas for connection to a heat network.

4.1.3 Where connection to heat networks is not a feasible option then other options may be suitable, for example heat pumps and/or improved insulation. The draft LHEES identifies strategic geographical heat zones based upon areas with i) building types – for each building type assumptions can be made on how energy efficient the property is and energy efficiency options that might most effective for that type of property. This is data driven and based on the 'Home Analytics' data set which covers the whole of Scotland and contains data on: the physical characteristics (wall type, levels of insulation and glazing); heat and energy demand; renewable technology suitability; probability of fuel poverty; and EPC ratings. ii) energy connection profiles for areas based upon data identifying if properties are on or off the gas grid. iii) From information derived in i) and ii) the draft LHEES sets out optional measures for reducing emissions within each zone; The LHEES will be reviewed on a five-year basis.

4.2 Accompanying the LHEES is a Local Heat and Energy Efficiency Strategy Consultation (Appendix 2). The Strategy Consultation sets out how the overall LHEES will be delivered and outlines the practical steps and measures that will be required to be undertaken directly by South Ayrshire Council, those that should be led by South Ayrshire Council, and those which must be delivered in partnership with other stakeholders. The Delivery Plan has been developed in partnership with relevant stakeholders and provides an initial outline to pinpoint targeted interventions and early measures. It should be noted that there is currently no

funding (other than that identified in paragraph 4.6 below) identified to progress the Delivery Plan to implementation. However. The LHEES and the Delivery Plan provide the strategic framework to enable bid submissions to be made should funding opportunities become available.

4.3 The delivery plan will identify short to medium term actions and will be updated annually to reflect changes in the policy landscape, funding opportunities, and technological innovation. It is anticipated that the Delivery Plan will evolve and develop considerably over the 5 year lifespan of the LHEES.

4.4 In order to manage the development of the delivery plan it is appropriate that the Council establishes a Member/ officer governance group to manage the delivery of the Delivery Plan coordinating activities and reporting annually on implementation progress and confirming actions for the following year.

4.5 Officers are giving consideration to the appropriate membership, quorum and remit of the Member/ Officer Working Group and will bring forward these recommendations in the report to Council confirming the outcome of the public consultation and recommending a finalised LHEES.

4.6 Annual funding of £75,000 was allocated by Scottish Government for LHEES work until 2027/28. An officer was recruited in October to lead LHEES work, and consultancy support through Ricardo Plc has been in place to develop an initial report using the SG methodology. This work is being undertaken concurrently with the Ayrshire Energy Masterplan (AEM); a pan Ayrshire project to support clean growth ambitions and investment opportunities.

4.7 The SG deadline for publishing LHEES and Delivery plan was 31 December 2023. The timeline for delivery of this has been significantly shorter than strategies of a similar scale and the Scottish Government have not objected to South Ayrshire Council's short delay to provide Cabinet and the public with the most complete and highest quality output for their consideration.

4.8 The Scottish Government's publication requirements state that public consultation should be undertaken on draft Strategies and Delivery Plans before they are adopted and published and that this consultation should follow the local authorities own processes and practices. South Ayrshire Council will undertake a public consultation for a period of 8 weeks. Consultation will be undertaken with internal departments, private and registered social landlords, tenants, the SAC 1000, community planning partners, HSCP, NHS, and community groups across South Ayrshire.

4.9 Once consultation is complete, and having regard to representations made, as appropriate, a finalised Local Heat and Energy Efficiency Strategy and Delivery Plan will be reported to Council with a recommendation for approval and adoption. The Delivery Plan will continue to be monitored by the Member/ Officer Working Group as described in paragraph 4.3 above and updated annually.

5. Legal and Procurement Implications

5.1 There are no direct legal implications arising from this report. Any legal implications arising from the Delivery Plan actions will be considered and addressed as appropriate through their development.

5.2 There are no procurement implications arising from this report.

6. Financial Implications

6.1 There are no financial implications directly arising from this report, as the identified actions will be undertaken using existing resources or delivery will be subject to securing external funding. As the action planning and delivery/ governance process continues, an assessment of available and required resources and financial implications will be undertaken and subject to agreement.

7. Human Resources Implications

7.1 Not applicable.

8. Risk

8.1 ***Risk Implications of Adopting the Recommendations***

8.1.1 LHEES and their Delivery Plans are inherently ambitious documents. As such there is a risk that ambition outstrips available financial and other resources. Expectations will need to be managed accordingly.

8.2 **Risk Implications of Rejecting the Recommendations**

8.2.1 Rejecting the recommendations may result in a delay or failure to publish the LHEES and Delivery Plan in contravention of Local Heat and Energy Efficiency Strategies (Scotland) Order 2022. Rejecting the proposals may reduce South Ayrshire Council's ability to access relevant funding streams and opportunities. Further, rejecting the proposals may impair the Council's ability to develop other strategic areas of work e.g. the LDP in relation to heat networks.

9. Equalities

9.1 The proposals in this report have been assessed through the Equality Impact Assessment Scoping process. There are no significant potential positive or negative equality impacts of agreeing the recommendations and therefore an Equalities Impact Assessment is not required. A copy of the Equalities Scoping Assessment is attached as Appendix 3.

10. Sustainable Development Implications

10.1 ***Considering Strategic Environmental Assessment (SEA)*** - This report was subject to a screening report through the appropriate consultation authorities. From this it was determined that a full SEA was not required.

11. Options Appraisal

11.1 An options appraisal has not been carried out in relation to the subject matter of this report.

12. Link to Council Plan

12.1 The matters referred to in this report contribute to Priority One: Spaces and Places

13/

13. Results of Consultation

13.1 There has been on public consultation on preparation of the LHEES, however, the recommendations of this report include arrangements for consultation on the draft LHEES.

13.2 Consultation has taken place with Councillor Martin Kilbride, Portfolio Holder for Buildings, Housing and Environment, and the contents of this report reflect any feedback provided.

14. Next Steps for Decision Tracking Purposes

14.1 If the recommendations above are approved by Members, the Assistant Director - Planning and Development will ensure that all necessary steps are taken to ensure full implementation of the decision within the following timescales, with the completion status reported to the Cabinet in the 'Council and Cabinet Decision Log' at each of its meetings until such time as the decision is fully implemented:

Implementation	***Due date***	***Managed by***
Publication of Draft LHEES and Delivery Plan	1 February 2023	Service Lead - Asset Management and Community Asset Transfer
LHEES and Delivery plan laid before South Ayrshire Council and recommendations regarding the format of the Member/ Officer Working Group	27 June 2023	Service Lead - Asset Management and Community Asset Transfer

Background Papers **None**

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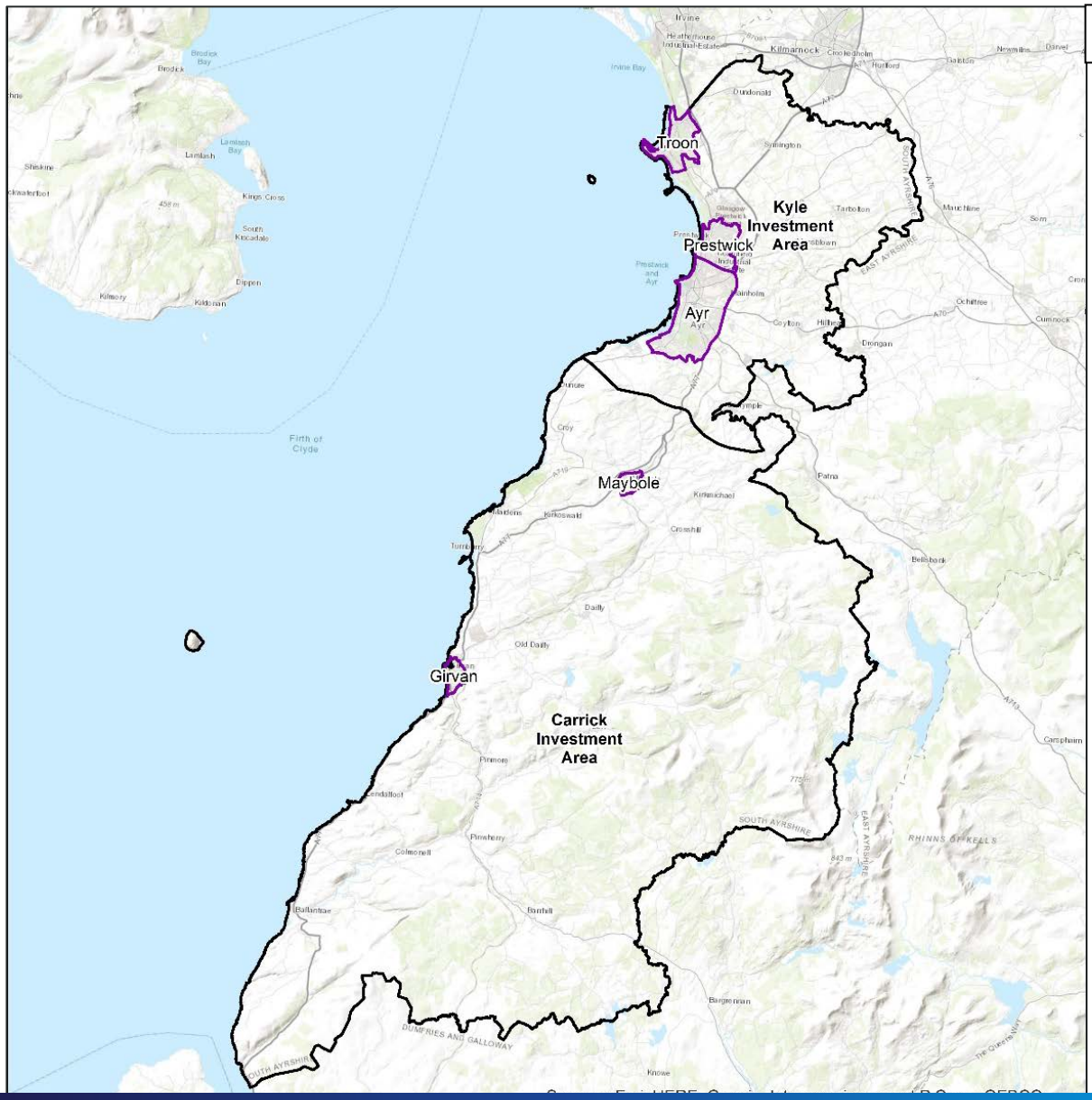
Date: 10 January 2024

Appendix 1



Local Heat and Energy Efficiency Strategy

Report for: South Ayrshire Council

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Document History

Revision	Description	Prepared	Date Issued
1	Draft for Council input	SR	21/11/2023
2	Updated after comments	JG	18/12/2023
3	Final version	SR	19/12/2023
4	Final version	JG	04/01/2023
5	Maps added to appendix	SR	05/01/2023

Contents

Refer to Appendix A for a list of the tables and figures included in this report.

1. Executive Summary

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.

LHEESs are primarily driven by Scotland's statutory targets for greenhouse gas (GHG) emissions reduction and fuel poverty[2]:

- Net zero emissions by 2045 and 75% reduction by 2030; and
- In 2040, as far as reasonably possible, no household in Scotland is in fuel poverty.

This strategy targets improvements in energy efficiency and moves to low carbon heat sources.

Current overview – Domestic

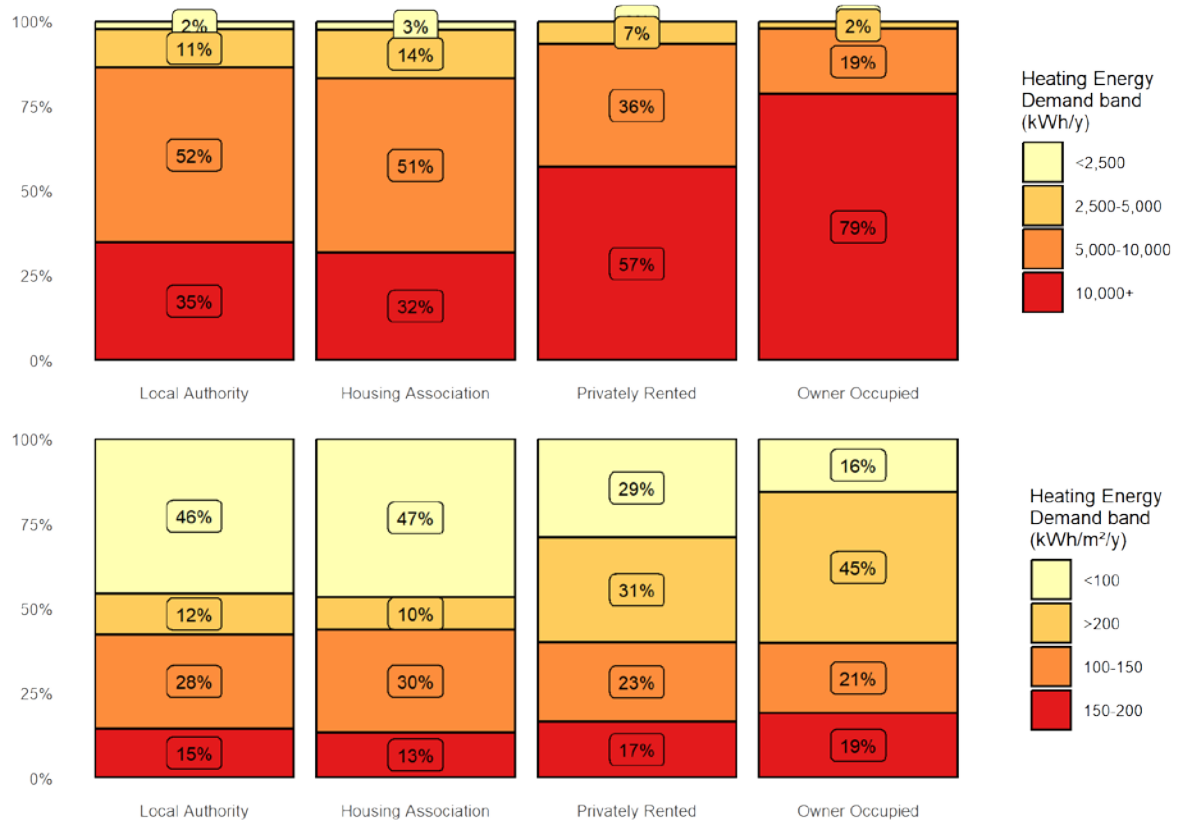
The majority of the domestic building stock in South Ayrshire was constructed after 1950 (Figure 2) but 87 % of South Ayrshire Council's stock was built before 1983. By contrast, the housing association stock has a larger proportion of newer builds and this may be reflected in the greater proportion of housing association properties reaching an EPC grade of C or better.

Data shows that SAC's domestic properties have a good level of energy efficiency, with only 2% requiring glazing upgrade and 11% requiring wall insulation upgrades. Data does shows potential improvements in loft insulation top up. This presents a challenge in meeting increasing EPC requirements and moves to net zero as remaining measures are likely to be at a higher cost.

The private sector has a greater challenge to improve EPCs both proportionally and in absolute numbers of properties and South Ayrshire Council will consider how these upgrades can be supported.

This is illustrated in the figure below, showing higher heat demand in private and owner occupied tenures compared to local authority and housing association properties.

Figure ES1: Domestic heating energy demand



[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)

Current overview – Non-domestic

Confidence in the non-domestic dataset used for this analysis is low and work is required to improve data collection and quality. This will be supported through the Scottish Government's Building Assessment Report (BAR) process and work on the Ayrshire Energy Masterplan (EAM).

Strategic zoning and pathways

The LHEES guidance requires the Council to set out strategic zones and develop pathways for each. Local development planning boundaries were chosen as they link with aligning strategies and policies.

Energy Efficiency

Weighted scores for energy efficiency were developed for each strategic zone based on the three key measures of loft insulation thickness, wall insulation, and glazing upgrade. Higher scores illustrate a lower energy efficiency.

Table ES1: Domestic energy efficiency weighted scores by strategic zone

Strategic Zone	Number of interventions required				Percentage of housing stock				Total Weighted Score
	Loft Ins.	Glazing Upgrade	Wall Ins.	All	Loft Ins.	Glazing Upgrade	Wall Ins.	All	
Carrick	819	373	2,159	3,351	21 %	10 %	56 %	87 %	29
Kyle	801	375	2,500	3,676	10 %	5 %	31 %	45 %	15
Ayr	2,147	1,488	8,552	12,187	9 %	6 %	35 %	50 %	17
Girvan	497	191	1,418	2,106	14 %	6 %	41 %	61 %	20
Maybole	250	133	954	1,337	11 %	6 %	42 %	58 %	20
Prestwick	955	310	3,278	4,543	13 %	4 %	44 %	61 %	20
Troon	709	290	3,225	4,224	9 %	4 %	40 %	53 %	18
Total	6,178	3,160	54,180	14,386					

Cost effectiveness of energy efficiency measures

Looking at the impact of energy efficiency measures on overall consumption helps to identify which measures are the most effective way to reduce heating demand, helping both fuel poverty and heat decarbonisation. Loft insulation upgrades is by far the lowest cost method to reduce heating demands. On the other hand, installing external wall insulation on the outside of buildings that already have cavity or internal wall insulation is deemed as the least cost-effective way to reduce heat demand. However, there may be other reasons for doing less cost-effective measures, such as funding streams being allocated only to specific measures or improving the aesthetics of the building with external wall insulation or window upgrades.

Table ES2: Summary of energy efficiency interventions across all buildings in South Ayrshire

Measure	Heat Demand Reduction (kWh/y)	Fuel Savings per Investment Cost (£/£)
All wall insulation measures	**160,400,000**	**0.040**
All loft insulation measures	**181,700,000**	**0.430**
All Single to Double Glazing upgrade	**6,600,000**	**0.064**
All cylinder insulation measures	**16,600,000**	**0.192**
All Combined Measures	**365,300,000**	**0.062**

Fuel Poverty

The Weighted Scores were calculated for each Locality to compare the potential to reduce fuel poverty by improving energy measures. This combines the energy efficiency score with the risk that each household is in fuel poverty, taken from Home Analytics.

Carrick and Girvan stand out above the others and the interventions discussed in 7.4 will help to reduce these scores.

Table 1: 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
Carrick	34 %	43 %	31
Kyle	21 %	7 %	18
Ayr	22 %	9 %	19
Girvan	33 %	21 %	27
Maybole	27 %	15 %	23
Prestwick	18 %	4 %	19
Troon	19 %	4 %	18

Heat Networks

An analysis of the potential for heat network zones indicates that there are broadly two areas where heat networks may be viable – within Ayr and an industrial cluster near Girvan.

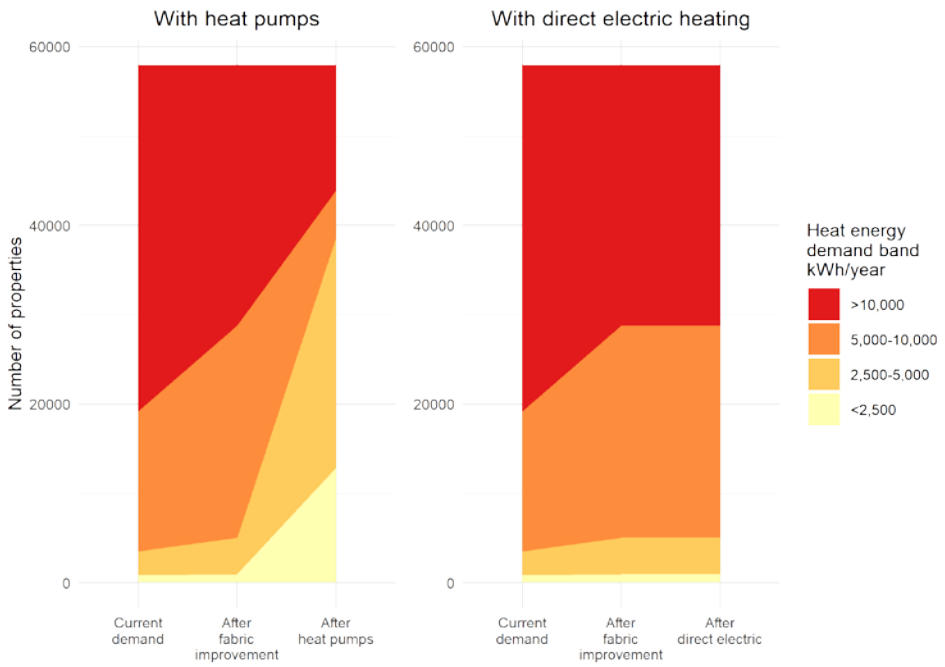
Within Ayr there are three separate zones identified, however, this strategy considers them in the context of a single heat network strategy for Ayr rather than considering them three discrete opportunities.

Two of the heat network zones in Ayr show sufficient total load and anchor points to consider construction and intersect with identified business development areas. These zones also cover a significant amount of conservation areas and listed buildings, which can be hard to treat with other low carbon heat sources. The Girvan industrial cluster is within close proximity to an existing feasibility study, which will be reviewed under new funding structures.

The LHEES work will also take cognisance of developing commercial networks such as Dalquharran estate feasibility mine water geothermal project.

Heat pump suitability

From this analysis up to 49% of domestic properties in South Ayrshire could be suitable for heat pump installation without significant interventions. If reasonable energy efficiency measures were applied, this increases to 65%. Applying all possible energy efficiency interventions increases this to 74%, leaving 26% of properties less likely to be suitable for a heat pump with current prices and technologies.



As shown above, heat pumps can contribute to reduction in total energy demand and support reduction of fuel poverty in turn.

Individual or communal heat pumps

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

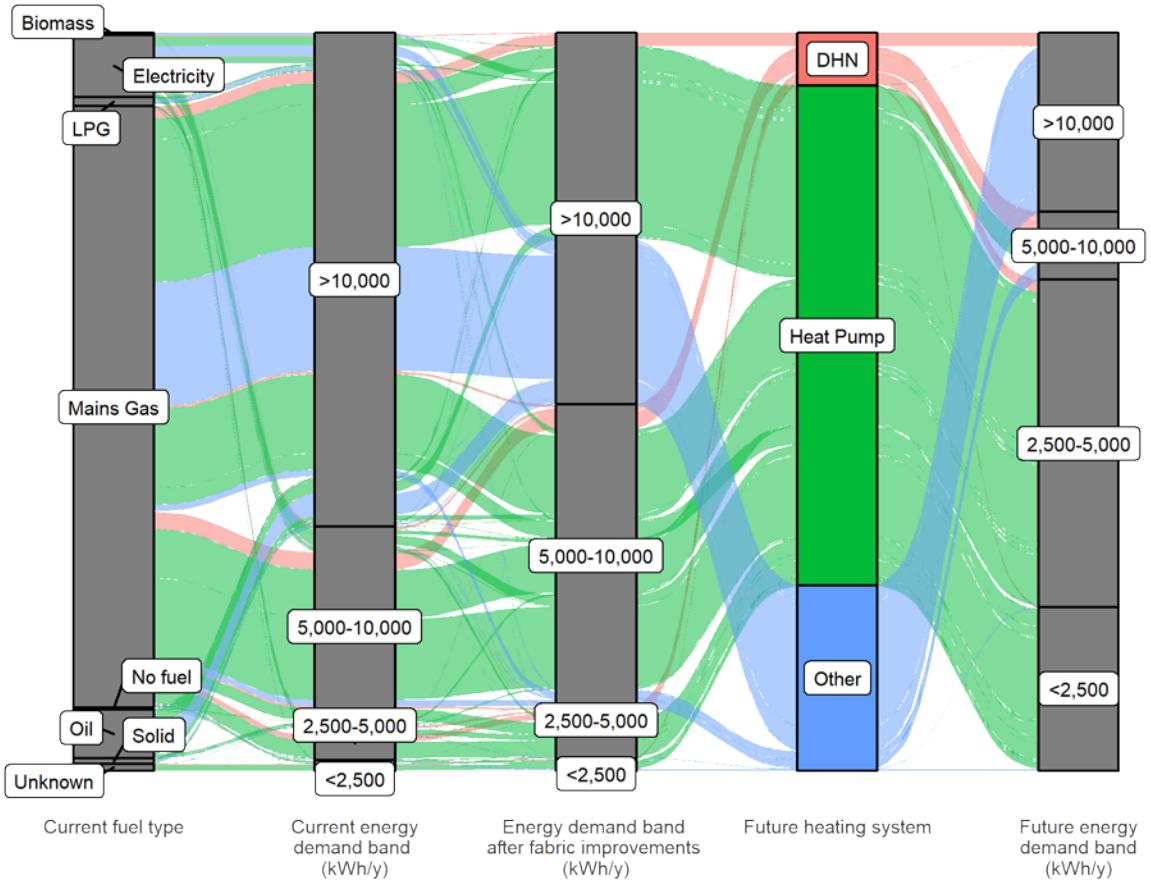
Delivery zones

Two approaches to identifying actions are set out in this LHEES – a spatial approach identifying delivery zones to make use of area-based funding and align with local priorities, as well as grouping properties and interventions based on them having similar attributes regardless of location. To ensure that the best social and financial value, this LHEES will look to overlay multiple considerations when planning interventions.

Pathways

The journey to the decarbonisation of each domestic property in South Ayrshire is shown below. The first column shows the properties current fuel source. The second groups the properties by their total current heat demand. The third column shows changes if reasonable energy efficiency measures are applied. The fourth shows potential future heating systems, and finally, the column on the right shows the resulting change in total heat demand.

Figure ES2: Decarbonisation and energy efficiency pathway



From this, heat pumps will play a large part in decarbonisation of South Ayrshires domestic properties. This assumes that all areas of heat network are developed but does not consider expansion beyond the current scope.

Stakeholder consultation

Engagement with stakeholders was sought and undertaken, both within the council and with external partners. Feedback was considered in the development of the LHEES, however there is scope to expand this through the consultation period and towards the full strategy release and implementation.

Conclusions

From this analysis, energy efficiency and heat pump development will play a large role in the decarbonisation of South Ayrshire properties, reducing energy demand and the risk of fuel poverty within the most vulnerable in society. Heat networks will play a part, but due to a lower heat density compared to more urban authorities this is confined to two main districts.

Significant levels of engagement will be required to support property owners in this transition, for both commercial and domestic sectors, and integrating works such as the Ayrshire Energy Masterplan will be essential. The data from this LHEES will support the prioritisation of both interventions and technology in future decision making.

With dedicated resource to support the LHEES process, the Council has the opportunity to play in supporting role in not only the decarbonisation of its own building stock but act as a coordinating partner for regional partners.

2. Abbreviations

Table 2: Abbreviations

Acronym	Description
BAR	Building Assessment Report
COP	Coefficient of Performance
EES	Energy Efficient Scotland
EESSH	Energy Efficiency Standard for Social Housing
EPC	Energy Performance Certificate
ESCCS	Environmental Sustainability & Climate Change Strategy
EST	Energy Saving Trust
GHG	Greenhouse gas
GIS	Geographic Information System
EES: ABS	Energy Efficient Scotland: Area Base Schemes
IZ	Intermediate Zone
LA	Local Authority
LHEES	Local Heat and Energy Efficiency Strategy
LPG	Liquefied Petroleum Gas
Mxd	Map Exchange Document
PEAT	Portfolio Energy Analysis Tool
SAC	South Ayrshire Council
SAP	Standard Assessment Procedure
UPRN	Unique Property Reference Number

3. Introduction

3.1 Overview of LHEES

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022[3] places a duty on local authorities to prepare and update a Local Heat and Energy Efficiency Strategy (LHEES) and Delivery Plan. This document is prepared by South Ayrshire Council (SAC) to fulfil its duty under that Order.

This Strategy sets out the long-term plan for decarbonising heat in buildings in the SAC area and improving their energy efficiency.

LHEESs are primarily driven by Scotland's statutory targets for greenhouse gas (GHG) emissions reduction and fuel poverty[4]:

- Net zero emissions by 2045 and 75% reduction by 2030; and
- In 2040, as far as reasonably possible, no household in Scotland is in fuel poverty.

The Strategy should:

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

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

3.2 Strategy Scope and Limitations

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

While there are some limitations with the domestic building dataset, which is primarily based on Home Analytics, it is of sufficient quality and reliability to allow detailed analysis and conclusions. However, the non-domestic data, which is primarily based on Non-Domestic Analytics, this is less reliable overall due to a dataset that has significantly more gaps in it and a much wider use for heat. the variety of heat uses and a significantly more limited dataset. For this reason, there are limitations to the level of detail in the outputs from non-domestic buildings.

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

[4] 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 mix 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 this Strategy, shown in Table 2. These help to categorise building stock into groups that require similar interventions.

Table 3: LHEES Considerations

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

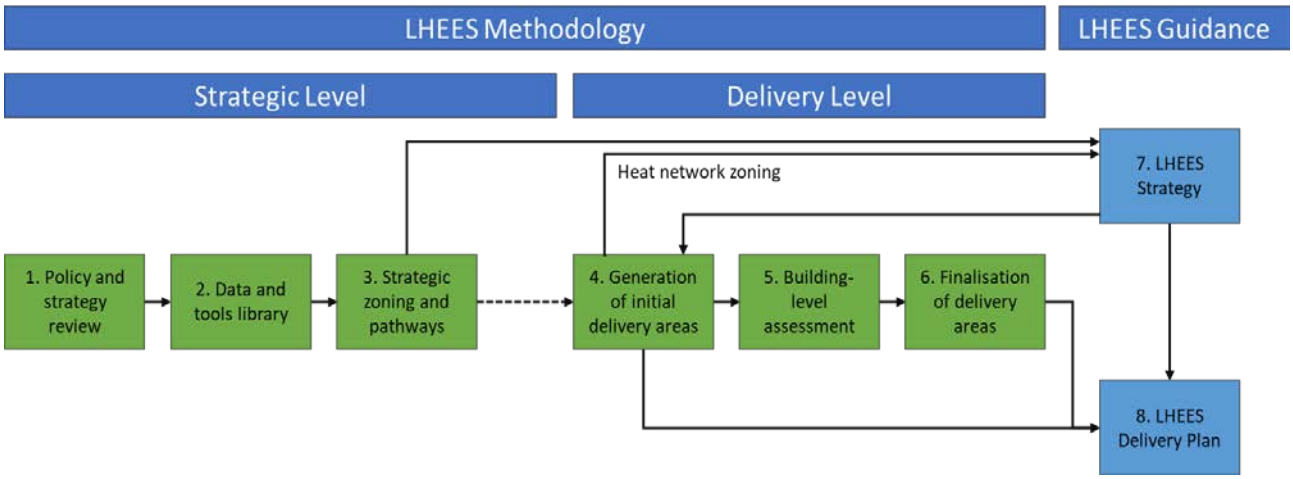
South Ayrshire Council policies do not differentiate by connection to the gas grid or if buildings are mixed tenure, mixed use and historic buildings. Instead, the policies apply to the full array of building stock.

4.1.3 LHEES Approach

A suggested LHEES methodology is supplied by the Scottish Government as shown in Figure 1. Although the approach used is based on the proposed methodology shown below, the details have been adjusted to suit the specific context of South 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 South Ayrshire Council with the data analysis and evidence base to enable development of this Strategy and the accompanying Delivery Plan document. The completion of work carried out in stages 1-4 feeds into the Strategy plan, and the completion of stages 4-6 alongside the Strategy feeds into the Delivery Plan.

Figure 1: Summary of LHEES Approach and Stages



4.2 Heat Decarbonisation Interventions

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

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

Table 4: Heat decarbonisation interventions

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
Energy efficiency	Measures such as double glazing, draught proofing and insulation reduce energy demand which in turn increases the viability for switching to low carbon heat sources	Improved energy efficiency leads to reduced energy costs, which reduces fuel poverty. Grants and loans are available for lower income households.	Where feasible and cost-effective, 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, ground, water or waste water. Grid electricity is continuing a trend of decarbonisation through renewable energy.	Appropriately designed and well-running heat pumps can reduce costs, particularly compared to electric heating. Savings are dependent upon the relative price of electricity compared to the fuel displaced as well as the coefficient of performance (COP) of the installation. Replacing electric heating with a heat pump can reduce energy consumption and reduce fuel poverty.	Heat pumps are commonly used in cold climate, such as Scandinavia and research has found that all UK house types are suitable for heat pumps[5]. Where necessary, upgrades to heat emitters or hot water storage can present practical challenges in some properties. The electricity network will need to accommodate increase in electricity demand from heat pumps, direct electrical heating, and other energy sources such as Electric Vehicles. Hot water production is usually provided through a hot water cylinder, which requires space in a property.
Heat networks	Heat networks, which use waste heat, heat pumps or bioenergy as their energy source	The Competition and Markets Authority found that up to 90 % of heat network customers enjoy similar, or lower, bills than those with standard gas boilers and heat networks can cut both emissions and bills.	Heat networks are suitable for all building types but only in areas with a sufficient density of heat demand
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, the high cost of electricity must be considered for households at risk of entering fuel poverty. Storage heaters can be used to harness cheaper electricity at night but can emit and waste heat when not required	Electric heating is suitable for all properties with a suitable electricity connection. Hot water production is usually provided through a hot water cylinder, which requires space in a property.

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

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
Bioenergy	Sustainably sourced, bioenergy (i.e., solid biomass, biogas or biomethane) is regarded as carbon neutral	There is uncertainty surrounding the future supply of bioenergy and biomass boilers tend to have more maintenance requirements than gas boilers	HIBS indicates that bioenergy is likely to have a limited role in the decarbonisation of the building stock. There may be some buildings for which bioenergy can play a role, for example in hard to treat off-gas properties where heat pumps are unsuitable. However, the UK's Green Gas Support Scheme aims to increase the proportion of biomethane in the gas grid. A bioenergy Action Plan is due to be published in late 2023. Air quality concerns need to be considered in urban settings
Hydrogen	Green hydrogen is produced by splitting water using renewable electricity while blue hydrogen is produced from fossil fuels plus carbon capture. Therefore, both production routes are deemed as low carbon in UK and Scottish legislation. Increased availability of hydrogen for heat will have positive implications for the suitability of hybrid heat pump systems, which may be cost-effective solutions	Currently hydrogen is an underdeveloped fuel and is associated with high costs. The future of hydrogen prices is uncertain but may become competitive with other energy sources in the coming decades. However, without Government incentives prices for green hydrogen are unlikely to be lower cost than using direct electrical heating or heat pumps as hydrogen system efficiency is lower than using electrified heating.	Hydrogen is not currently available for supply of heat to domestic properties and is not seen as an immediate solution[6].

The Heat in Buildings Strategy[7] (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.

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

5. Policy and Strategy Context

5.1 LHEES Policy Context

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022 stipulates that each local authority area must prepare and publish (a) a Local Heat and Energy Efficiency Strategy, and (b) a local heat and energy efficiency Delivery Plan by the end of 2023. These will be the principal mechanism for locally-led heat planning. Both must be kept under review and updated at five yearly intervals.

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

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

The Scottish Government has more ambitious targets than the UK, with net zero by 2045 and 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 energy and energy efficiency, while many aspects of energy policy are reserved by the UK Government. Chapter 10 of the Heat in Buildings Strategy[10] (HIBS) discusses the need for the UK and Scottish Government to work alongside each other to facilitate the decarbonisation of heat.

5.2 Heat Decarbonisation – Scottish Government Policy

The Scottish Government’s Climate Change Plan update was published in December 2020[11]. 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.[12]

HIBS 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
4) Poor building energy efficiency as a driver for fuel poverty.

5.3 Energy Efficiency – Scottish Government Legislation

The Tackling Fuel Poverty in Scotland: A Strategic Approach[13] sets the target to maximise the number of fuel poor households attaining EPC B by 2040. At the time of writing, the Scottish Government are consulting on an EPC reform, which likely will have an impact on the grading of the building stock and the effect of measures[14]. 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, no more than 1 % are in extreme fuel poverty and the fuel poverty gap is no more than £250 (in 2015 prices).

[8] Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk)
[9] Heat Pump Investment Roadmap (publishing.service.gov.uk)
[10] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[11] Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot (www.gov.scot)
[12] Increased funding to tackle fuel poverty and climate change - gov.scot (www.gov.scot)
[13] Tackling fuel poverty in Scotland: a strategic approach - gov.scot (www.gov.scot)
[14] Energy Performance Certificates - Energy efficiency - gov.scot (www.gov.scot)

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 EPC 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.

5.4 Summary of Policy and Legislation

Scotland boasts a suite of legislation that supports the transition to Net Zero. These cover overarching targets for emission reduction and heat supply, energy efficiency drivers and planning, and support for skills development and Just Transition. Refer to Appendix B for a summary.

5.5 Local Policy and Strategy, and Linkages

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

Table 5: Local Policies and Strategies

Strategy, Policy, Plan	Description	Linkages
Local Housing Strategy	The LHS is a 5-year plan to support people of South Ayrshire to find good quality housing, develop a sense of identity and belonging, reduce homelessness, and support all residents in their ability to live in a warm, dry, energy efficient home that meets their needs.	Cross-cutting theme – Sustainability, climate change and biodiversity Agreed Principle: Healthy Homes and Fuel Poverty Outcomes: HH1, HH2, HH3, HH5
Local Development Plan	The LDP2 is a spatial land use document which guides the future use of land in our cities, towns, and rural areas. It considers and addresses land use issues arising from the implications of economic, social, and environmental change. In doing so, this document provides an overall, joined up approach to managing development that can set out ambitious but realistic long-term visions the South Ayrshire Council area.	Core themes C - Our Environmental Responsibilities How we will be mindful of our responsibilities for the protection of our natural, built, and cultural heritage resources. Core Principles: C1 – We will promote the sustainable use of natural, built, and cultural heritage resources. Strategic Policy 1: Sustainable Development - We will support the principles of sustainable development by making sure that development meets the following standards: - Designed to maximise energy efficiency through building siting, orientation, and materials, - Helps mitigate and adapt to the effects of climate change.

Strategy, Policy, Plan	Description	Linkages
		- Includes the use of micro-renewables, wherever appropriate - Wherever possible, Incorporates or facilitates the development of District heating / heat networks.
Strategic Housing Investment Plan 2023/24 – 2027/28	The Strategic Housing Investment Plan (SHIP) 2023/24 – 2027/28 sets out the strategic investment priorities for affordable housing over the next five years that will achieve outcomes set out in the Local Housing Strategy and HNDA.	Strategic priority – Sustainable Communities and Sustainable Developments All projects proposed in the SHIP will help to tackle fuel poverty and ensure that heat is affordable for residents by increasing energy efficiency and reducing the amount of energy required to heat the home.
Sustainable Development and Climate Change Strategy 2019 – 24	This strategy sets out a coherent framework for the council projects, policies and initiatives which promote sustainable development, mitigate climate changing emissions, and adapt to the impacts of climate change. It focuses on the themes of sustainable council, environment, and community with broad outcomes and actions for each.	Outcome 1 - reducing emissions from energy use, improving economic development opportunities, and embedding mitigation, adaptation, and partnership working. Outcome 3 - links through energy activities within local communities.

5.6 Summary of Ongoing Work at South Ayrshire Council

South Ayrshire has extensive work ongoing to reduce emissions within our own estate, and within our communities.

Internal:

- Strategic direction is coordinated through working groups on Net Zero and Sustainable Development & Climate Change, creating a pipeline of projects and consultation.
- Retrofit works are supported through SALIX funding, SAC central repairs, and through the ongoing capital program.
- Headline projects include:
    - Extensive LED lighting replacement over the past xx year
    - High consumer retrofits, including swimming pool ventilation and heat recovery
    - Installation of IQVision, building management software saving over £300,000 in two years
- Sustainability and energy efficiency are now driving principles in new builds, supported through Professional Design Services (PDS)
    - Renewables generated 770,000 kWh of our buildings heat and electricity in 2022/23 and continue to be a priority element of all new builds.
    - The Sustainable Design Guide in development will provide a framework to ensure industry best practice is implemented in all retrofit and new builds.
    - Continue to expand on our seven education buildings powered through low/zero emissions heating systems including Prestwick and Carrick Education campus', Dailly and Colmonell Primary Schools, and Forehill, Cherrytree, and Struthers Early Years centres.
    - These are joined by South Ayrshire's first net zero building, Bridge Street Depot, which will, instead of contributing to climate change, actively save 8 tonnes of CO2 every year

Housing:

- South Ayrshire continues to lead the way on energy efficiency improvements to social housing stock.
    - 92.19% of our social housing is compliant with Scottish Housing Quality Standards compared to a local authority average of 70.91%
    - 93.60% of our social housing is complaint with Energy Efficiency Standard for Social Housing compared to a local authority average of 87.63%
    - External wall insulation programs are ongoing through partners The Energy Agency, delivering over 3,200 projects since 2013
- Private landlords / RSL
- New Builds / Industry best practice
    - Work alongside partner organisations including private and registered social landlords to ensure industry best practice is applied in all new builds
    - Consultation

Community Planning Partners

- The South Ayrshire Community Planning Partnership is made up of 5 Strategic Delivery Partnerships which work together to deliver on the strategic themes of Place and Wellbeing with the vision of 'All together – growing, caring and living a better life'. The Sustainability Partnership is one of the 5 Strategic Delivery Partnerships developing and delivering our LOIP (Local Outcome Improvement Plan) and is focused on the four priority areas of energy, food, travel and nature as agreed by the Community Planning Executive in November 2023. The Sustainability Partnership also has a recognised role to work across all the SDPs given the cross-cutting nature of its role within the partnership. Further consultation and work to develop action plans and performance framework to support the new LOIP will be undertaken in 2024.

Economic Development

- The Ayrshire Energy Masterplan represents a cross-authority approach to develop a strategic energy vision for the Ayrshire region. This will include socio- and techno-economic modelling to identify investment opportunities, areas of business growth, and skills and supply chain development areas.

Strategic outcomes will link with LHEES through local energy and heat generation, decarbonisation, investment in local carbon technologies, and a just and inclusive energy transition.

- The strategy is due to be released in early 2024 and will link closely with the LHEES delivery planning.

6. Baselining

6.1 Baseline Summary Across South Ayrshire

6.1.1 Domestic Building Stock

The Home Analytics dataset records 57,949 domestic properties in South Ayrshire, with 8,567 being in the ownership of South Ayrshire Council and a further 2,330 owned by housing associations. Private landlords hold 6,697 properties, with 39,713 being owner-occupied. A further 530 addresses lack data and are excluded from the remainder of the analysis. There are conservation areas in South Ayrshire and 4,636 domestic properties are situated in those. Listed buildings make up just 2 % of the domestic building stock, with South Ayrshire Council owning just 26.

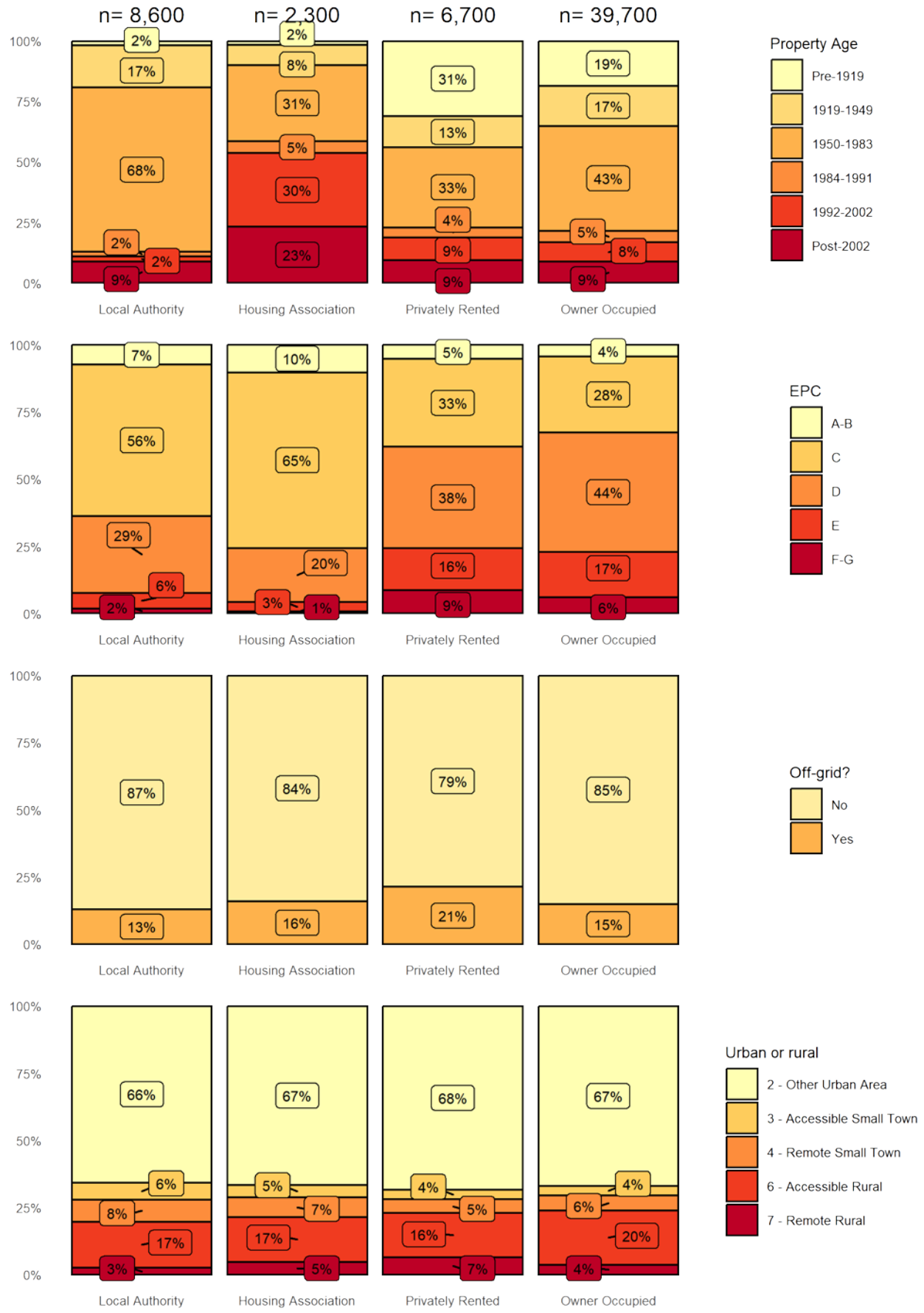
The majority of the domestic building stock in South Ayrshire was constructed after 1950 (Figure 2) but 87 % of South Ayrshire Council's stock was built before 1983. By contrast, the housing association stock has a larger proportion of newer builds and this may be reflected in the greater proportion of housing association properties reaching an EPC grade of C or better.

The private sector, though, has a greater challenge to improve EPCs both proportionally and in absolute numbers of properties and South Ayrshire Council will have to consider how this swathe of upgrades can be supported. A trickle of properties will return from the private sector to the local authority through the buy back scheme, which will give the Council the opportunity to improve them but the majority will need some other form of support or guidance.

Note that around one third of domestic properties are located in small towns and rural areas where future heat networks are unlikely to supply and so other routes to heat decarbonisation will be required.

It should be noted that the Home Analytics total differs from the Scottish Assessors Association total of 56,749 (December 2023); it is the Home Analytics data which is used throughout this report.

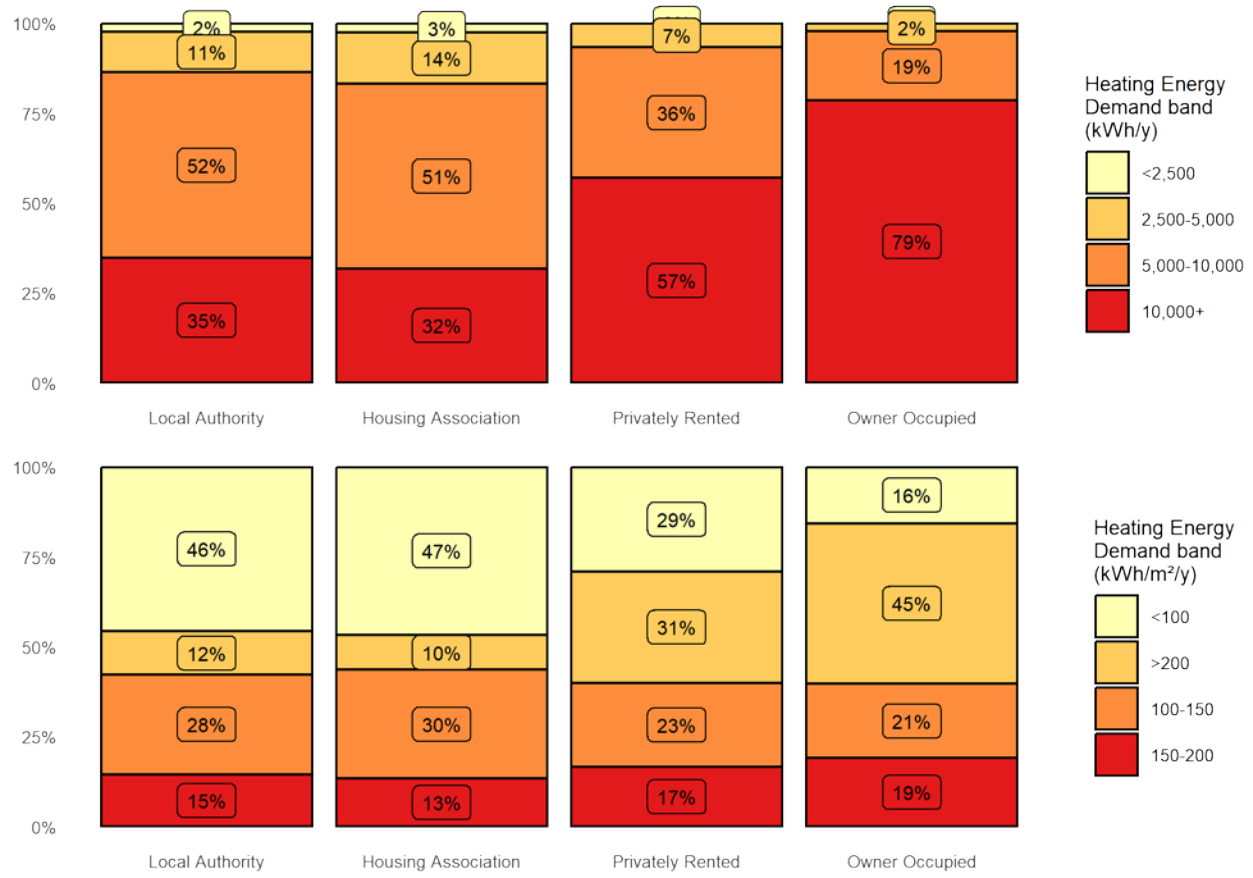
Figure 2: Domestic buildings- Distributions of age, EPC rating and gas grid connectivity by tenure type



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

EPC ratings include a number of other factors in addition to a property's demand for heat. Isolating the heating demand of properties allows an understanding of the existing heat demand and to isolate the benefit to households of energy efficiency measures from other factors which affect EPC rating. The properties have been split into bands by firstly their total requirement for heat and the heat required per m², based on what is recorded in the Home Analytics dataset, shown in Figure 3. As with EPCs, the worst performing homes are in owner occupied properties. For fuel poverty to be reduced the number of units of heat would need to be reduced (kWh/year) and heating energy demand per square metre (kWh/m^2/year).

Figure 3: Domestic heating energy demand



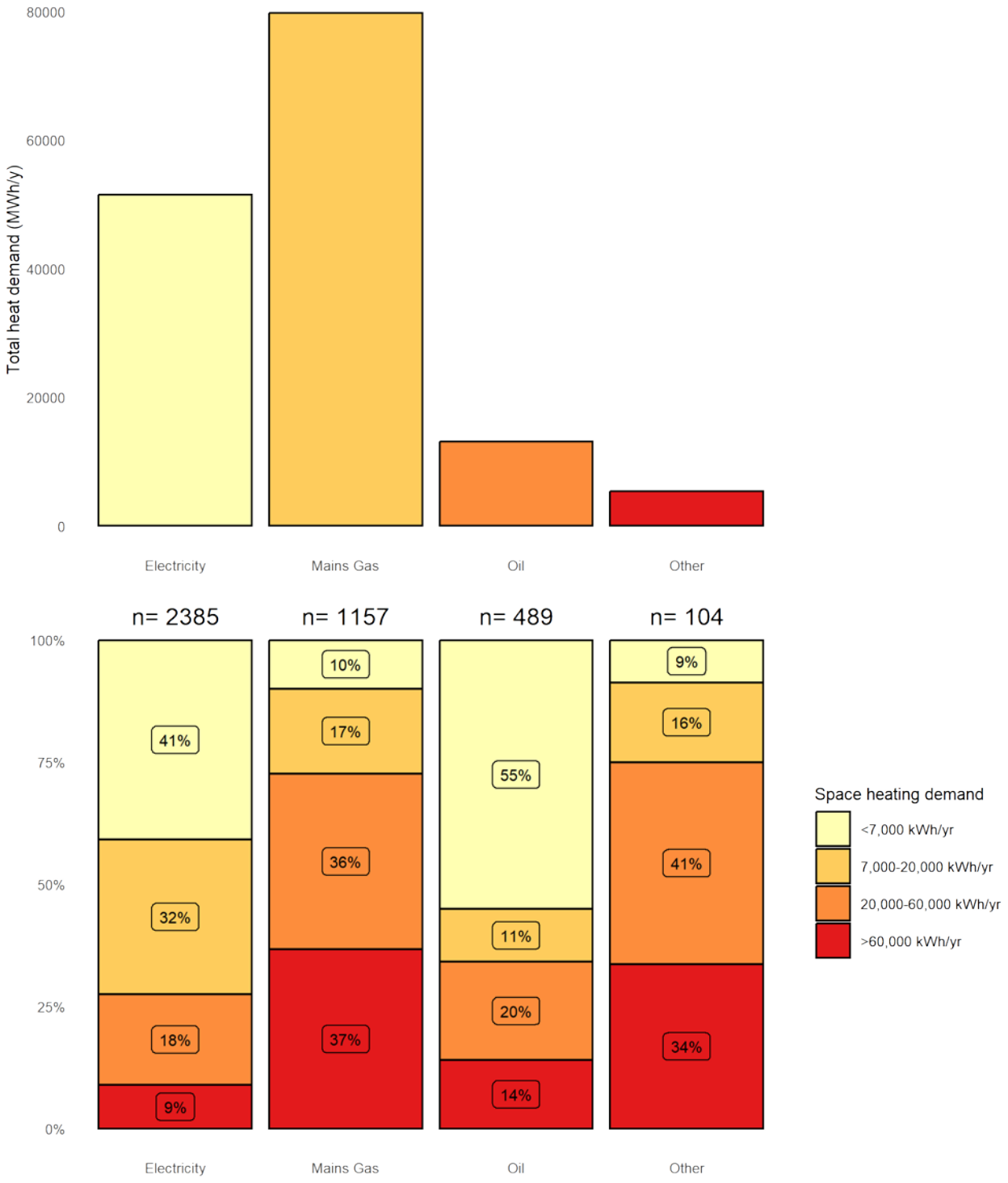
6.1.2 Non-domestic Building Stock

The Non-Domestic Baseline Tool utilises data derived from Non-Domestic Analytics, which is not based entirely on concrete data collected from building owners but is, in large part, imputed from a few measured parameters. For example, the floor area of a building may be estimated from its footprint on a map and an estimated number of levels based on its height. The energy consumption may then be estimated by multiplying the estimated floor area by a benchmark figure for the building type. This can lead to errors, of course, and so analytical results should be read with caution. To gauge the relevant degree of caution, Ricardo compared the top ten gas-consuming sites in South Ayrshire Council's portfolio with the corresponding entries in the dataset. Non-Domestic Analytics underestimated the demand of all ten sites by between 36 and 94 %. This indicates that the data may not be strong in identifying the correct energy demand.

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 4,135 non-domestic buildings in South Ayrshire. Together, these have an estimated total heat demand of 150,000 MWh/y.

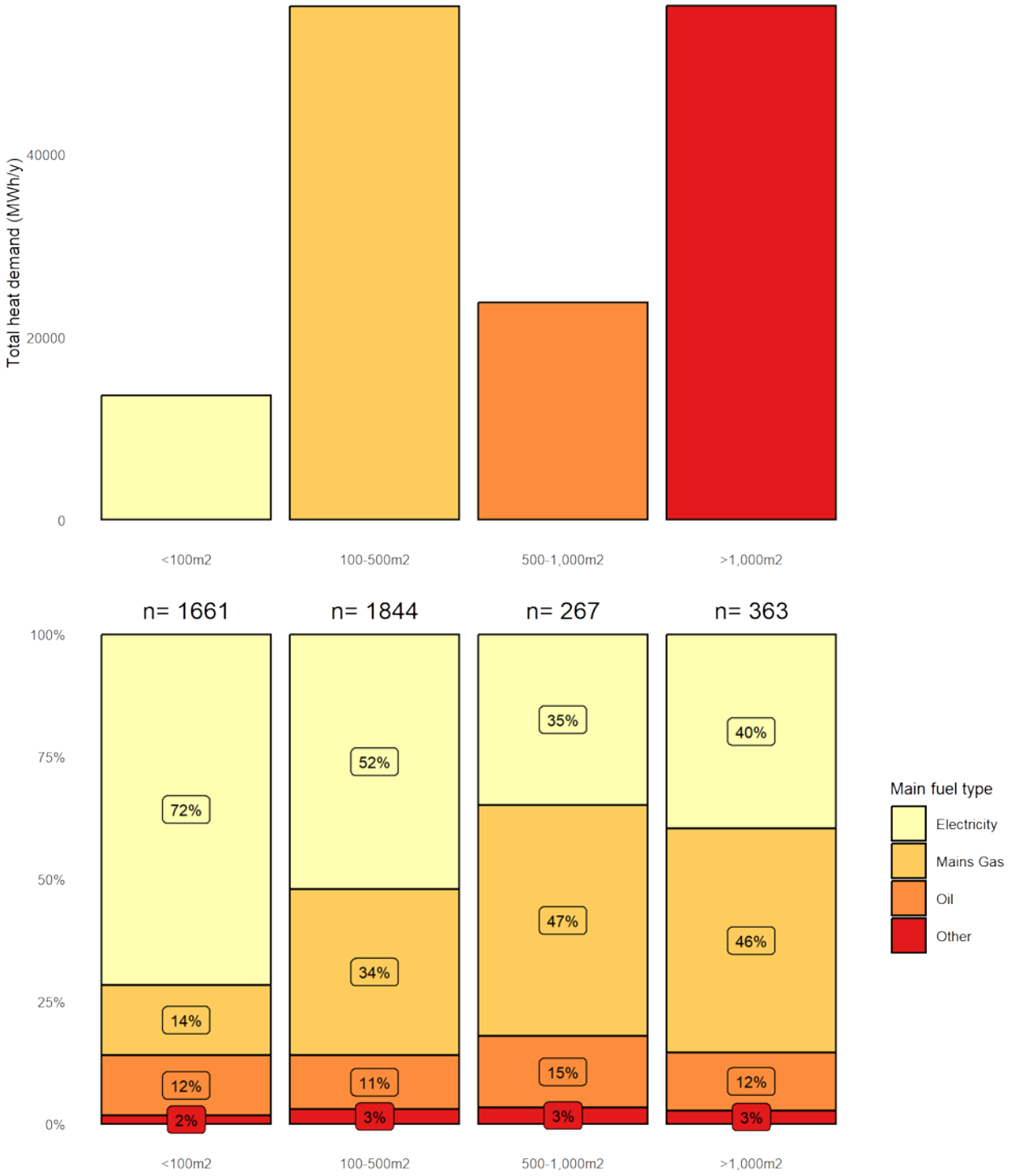
Figure 4 shows the aggregated heat demand for different energy sources. Gas is the biggest source of heat but electricity is close behind and, along with oil, they have the largest share of small heat loads. Smaller buildings account for almost half of the total heat demand (Figure 5) and targeting those small oil systems, which would not individually be expensive, for heat pump or heat network connection could be a priority. It is likely that the small properties utilising electricity are already using heat pumps for heating and cooling.

Figure 4: Non-domestic heat demand by energy source and demand category



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

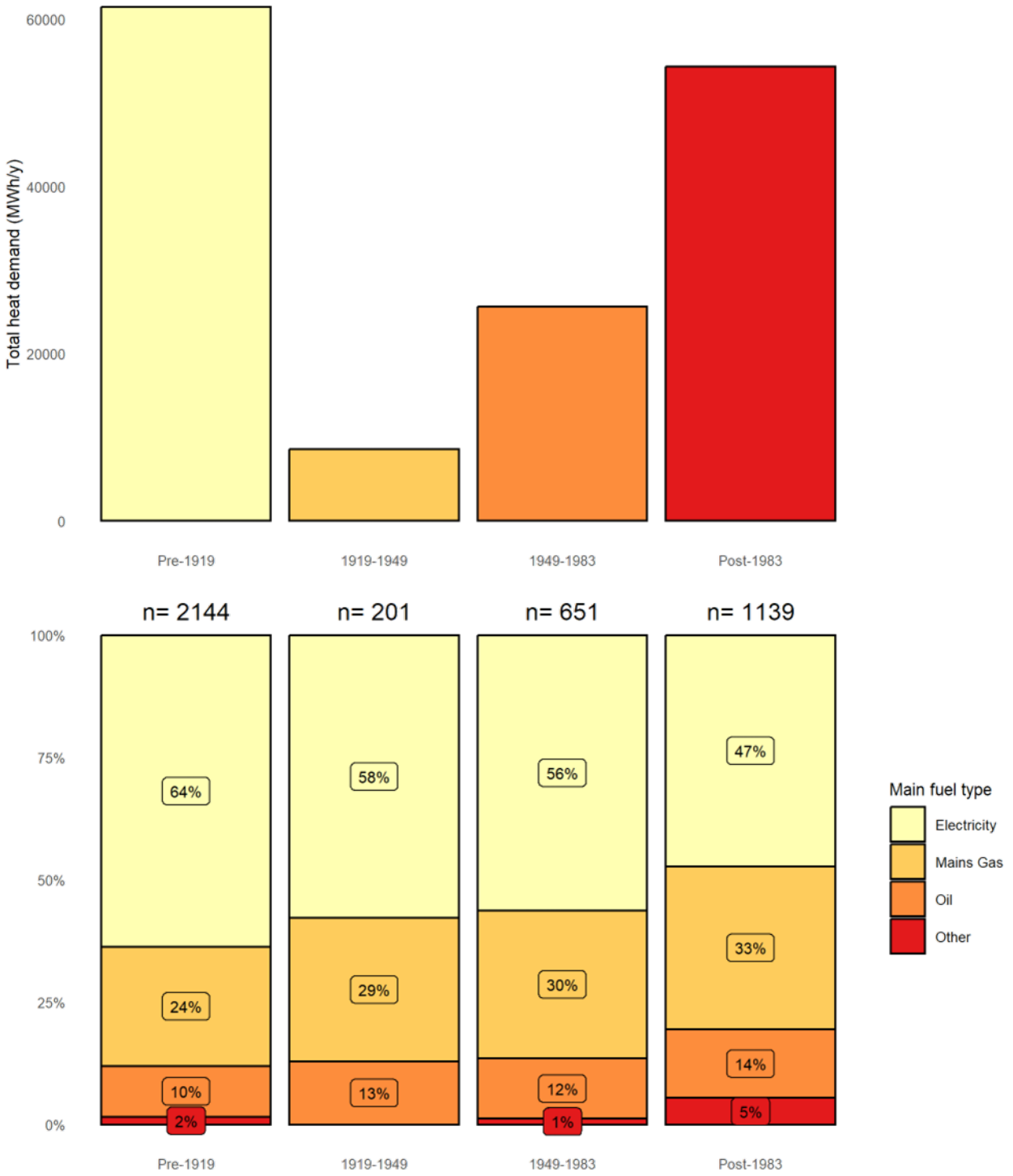
Figure 5: Non-domestic heat demand by energy source and floor area category



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

The pattern of building age (Figure 6) 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. The data lists 55 % of these pre-1919 buildings as being retail or financial and 79 % as being in towns and cities, so presumably these are typical high street properties.

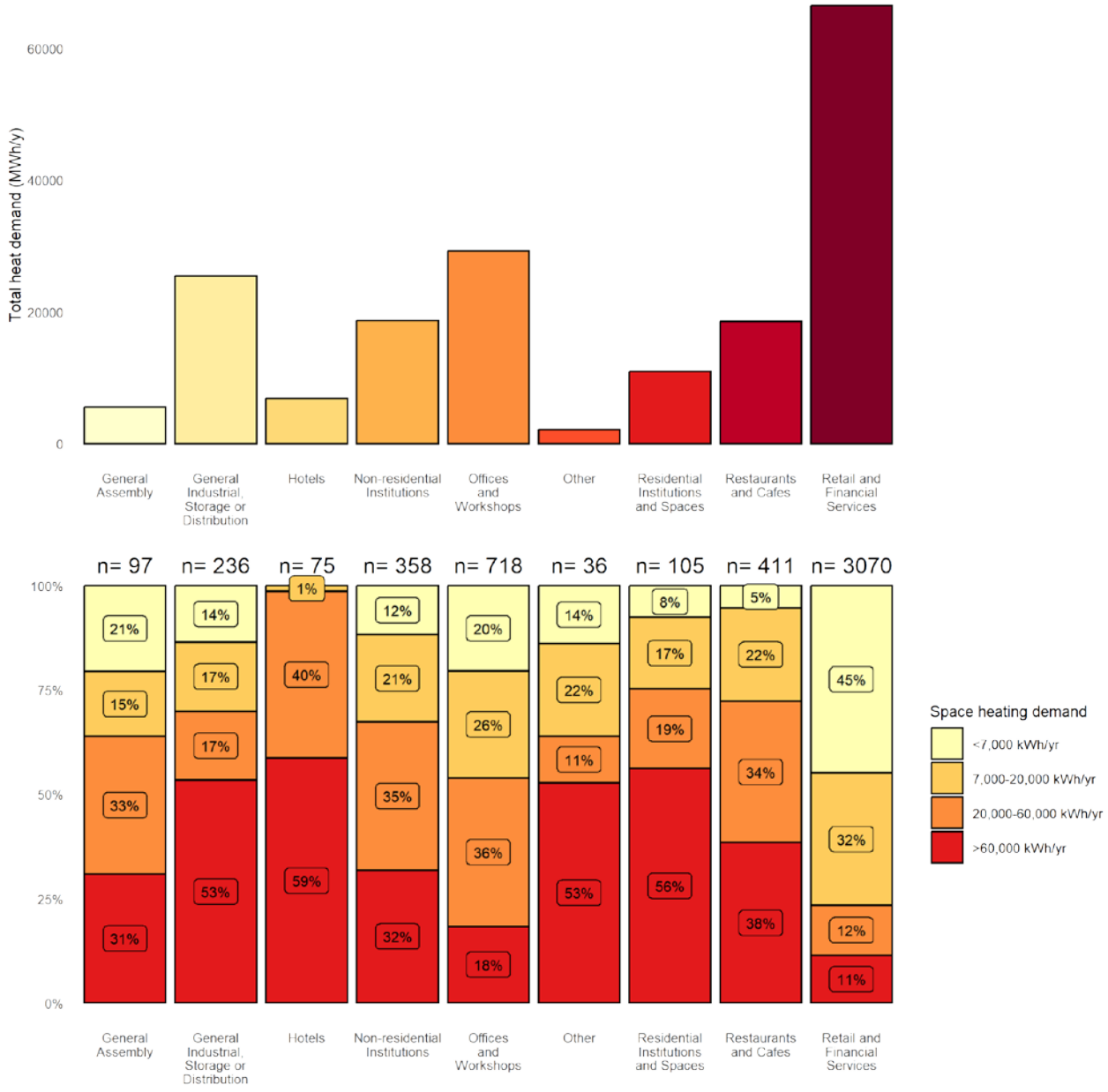
Figure 6: Non-domestic heat demand by energy source and building age category



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

Generally, non-domestic heating energy demand is dominated by the retail and finance sector (Figure 7).

Figure 7: Non-domestic building type by heat demand



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

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

7.1 Purpose

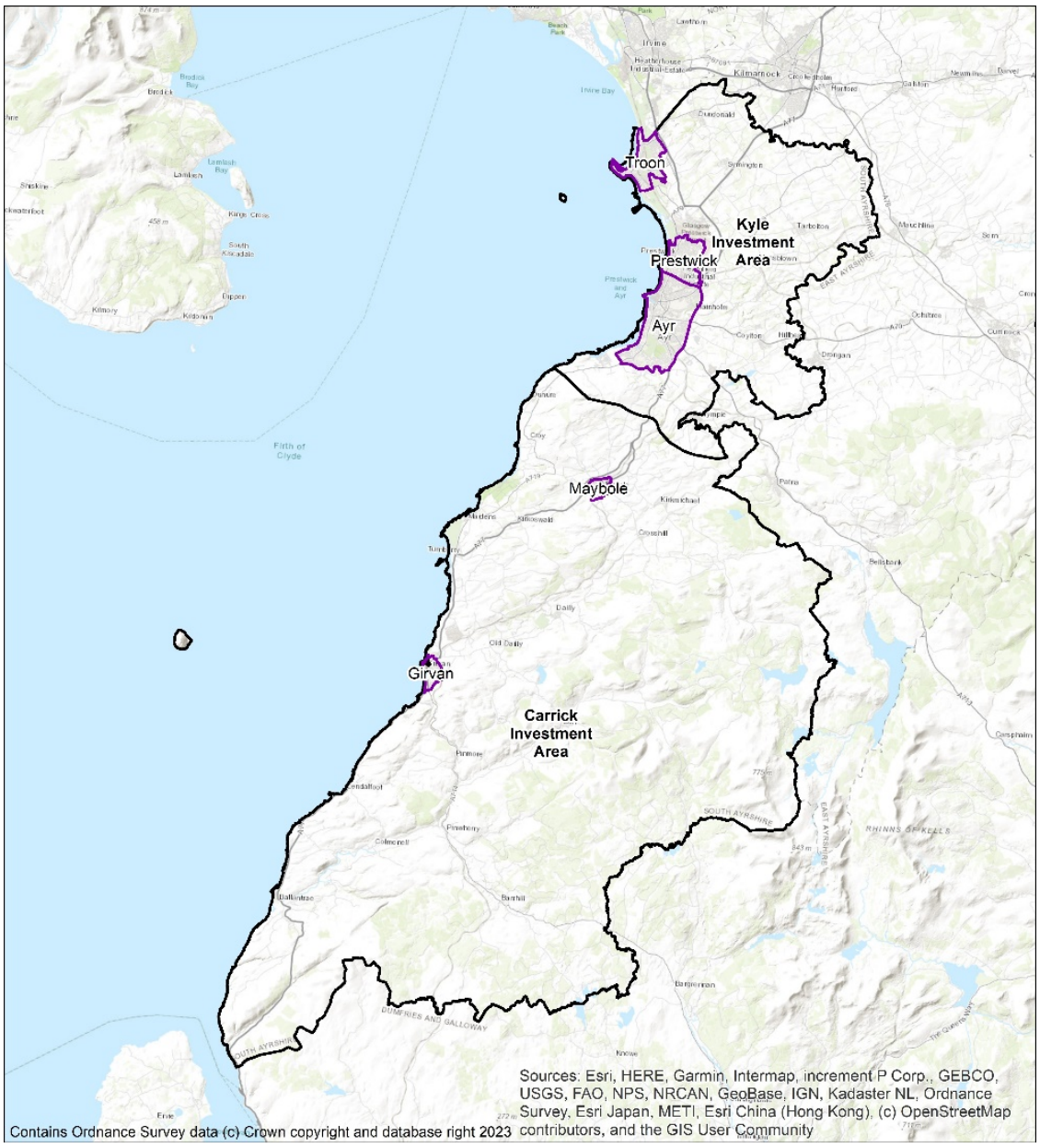
The LHEES Guidance requires the Council to set out Strategic Zones and develop a pathway for each. In this section the approach to selecting Strategic Zones is described, as well as the attributes for each which affect the strategic options.

7.2 Local Development Plan Areas as LHEES Strategic Zones

The standard methodology for LHEES generates ranked lists of places ("Intermediate" geographical zones) with the "poorest performing" homes with respect to the Indicators (see Appendix IAppendix C) and thus generates targets for intervention. This analysis is presented in Appendix A.

However, it is also possible to examine the data by South Ayrshire's own Local Development Plan boundaries and this is more appropriate for planning the delivery of LHEES actions. These zones are mapped out in Figure 8.

Figure 8: South Ayrshire's Strategic Zones



7.3 Domestic Properties and Tenure

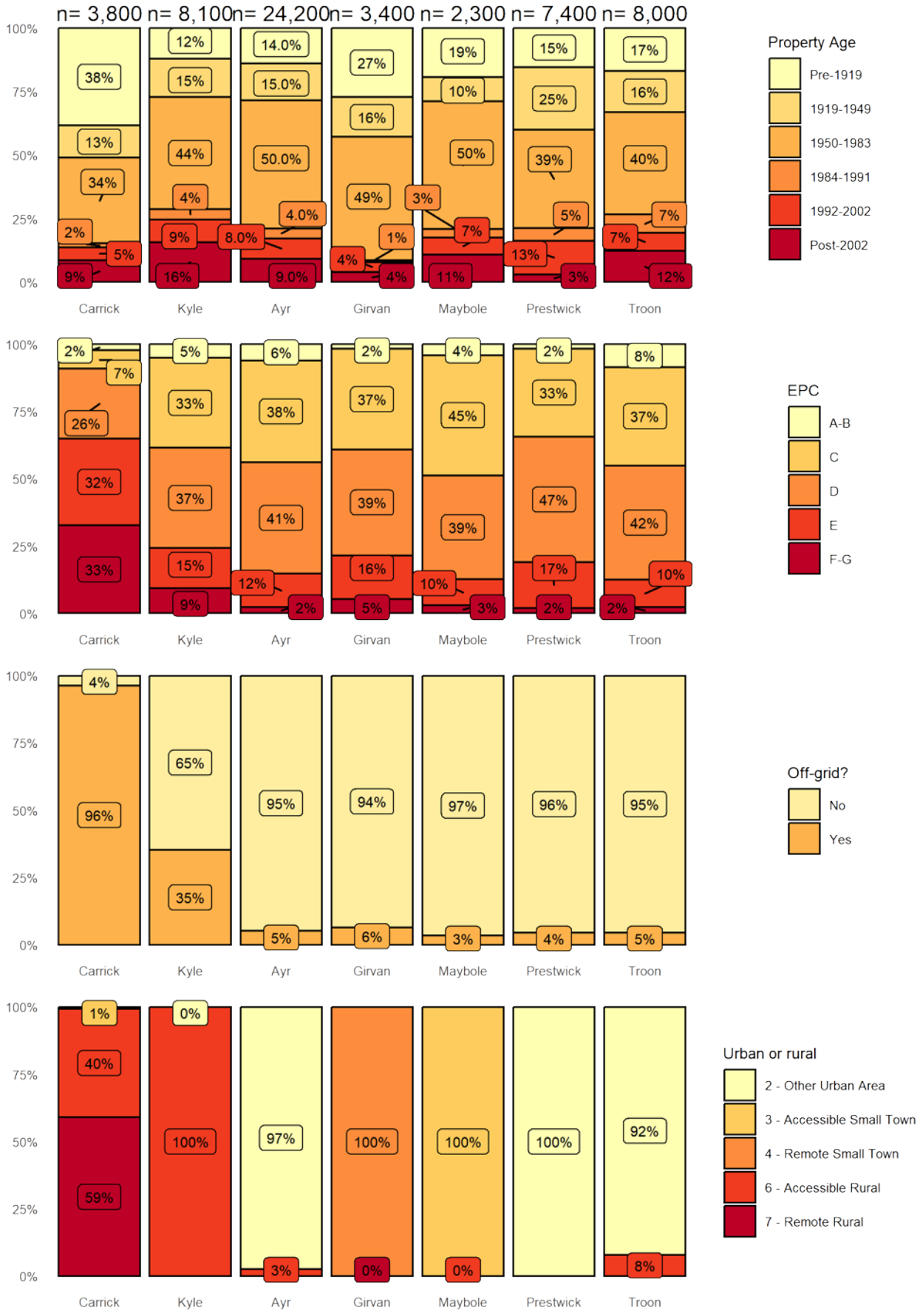
The numbers of domestic properties in the Home Analytics dataset, broken down by Zone and tenure are given in Table 5.

Table 6: Domestic properties in the Strategic Zones

Zone	Total domestic properties	Tenure				Mixed tenure in parent building
		SAC	Housing Association	Private Rental	Owner Occupied	
Carrick	3,800	470	170	660	2,500	214
Kyle	8,100	1,050	320	800	5,930	409
Ayr	24,200	4,210	1,150	2,940	15,900	5,232
Girvan	3,400	700	170	330	2,200	414
Maybole	2,300	520	110	240	1,450	311
Prestwick	7,400	680	210	770	5,740	908
Troon	8,000	930	210	940	5,920	1,647

A baseline assessment of these properties by area, similar to that in 6.1.1, is shown in Figure 9.

Figure 9: Baselining of domestic properties in the Strategic Zones



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

7.4 Domestic Energy Efficiency

The Weighted Scores for energy efficiency (Table 6) for the strategic zones, using the default weightings as discussed in Appendix I have been calculated. Carrick stands out with respect to the weighted scores, while wall insulation is a key requirement across all zones.

Table 7: Domestic energy efficiency weighted scores by strategic zone

Strategic Zone	Number of interventions required				Percentage of housing stock				Total Weighted Score
	Loft Ins.	Glazing Upgrade	Wall Ins.	All	Loft Ins.	Glazing Upgrade	Wall Ins.	All	
Carrick	819	373	2,159	3,351	21 %	10 %	56 %	87 %	29
Kyle	801	375	2,500	3,676	10 %	5 %	31 %	45 %	15
Ayr	2,147	1,488	8,552	12,187	9 %	6 %	35 %	50 %	17
Girvan	497	191	1,418	2,106	14 %	6 %	41 %	61 %	20
Maybole	250	133	954	1,337	11 %	6 %	42 %	58 %	20
Prestwick	955	310	3,278	4,543	13 %	4 %	44 %	61 %	20
Troon	709	290	3,225	4,224	9 %	4 %	40 %	53 %	18
Total	6,178	3,160	54,180	14,386					

The three suggested interventions broken down by strategic zone and tenure are shown in Figure 10. Much of the Home Analytics data is implied from other observations (wall construction type, for example) where there is no direct observation of a feature (wall insulation, for example) and this may mislead. A target for the LHEES strategy must be to improve the quality of the data used for decision-making and this may be done in tandem with the Scottish Government to improve the Home Analytics dataset.

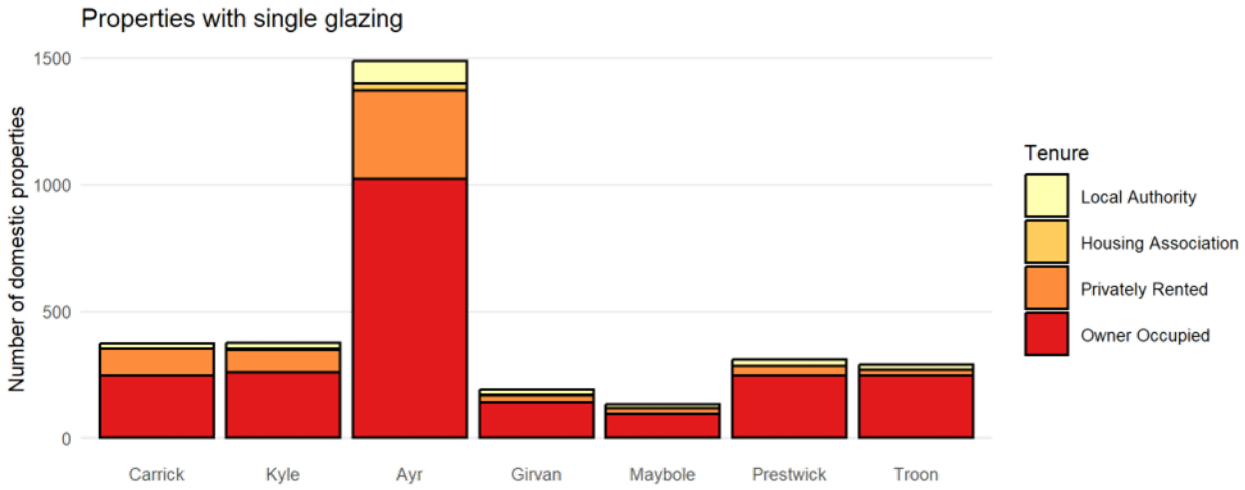
Notwithstanding the question over data confidence, it appears that, as noted in 6.1.1, the private sector is the key sector for targeting support for improvements.

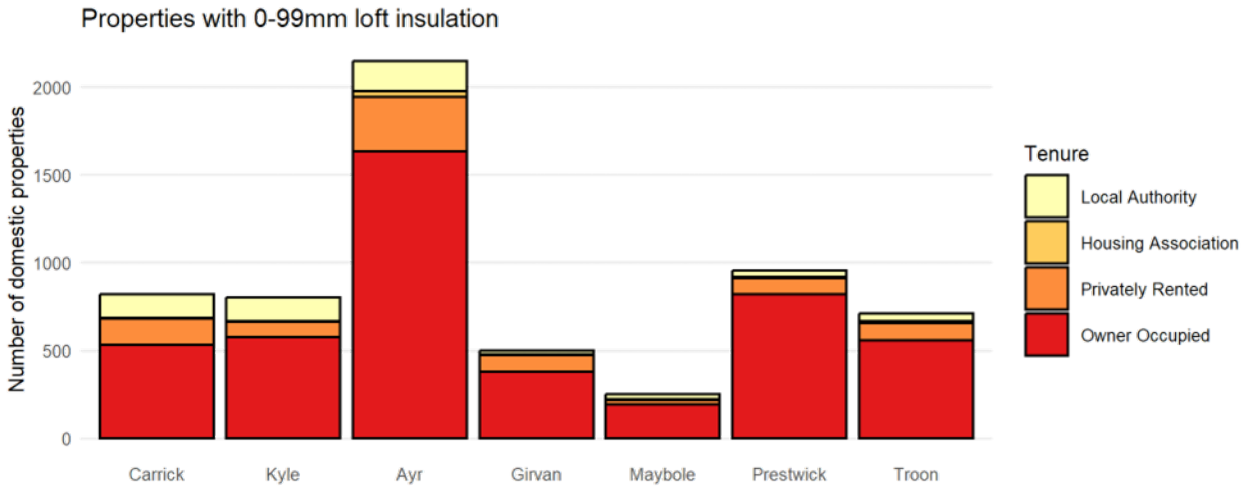
The biggest burden of potential interventions, according to Table 6, is wall insulation. Figure 11 shows that, in owner occupied homes, while there is a reasonable proportion of homes with solid walls which are hard to insulate, the most common construction type in every strategic zone is cavity walls, which should not hinder improved insulation.

Also in the private sector, 1,069 homes with single glazing are either listed or sit in conservation areas and, consequently, barriers to upgrades may be more than just financial.

There should be limited barriers to installing loft insulation to owner occupied and privately rented homes, since it is both cheap and usually easy to install.

Figure 10: Domestic properties requiring upgrades to glazing, and loft and wall insulation





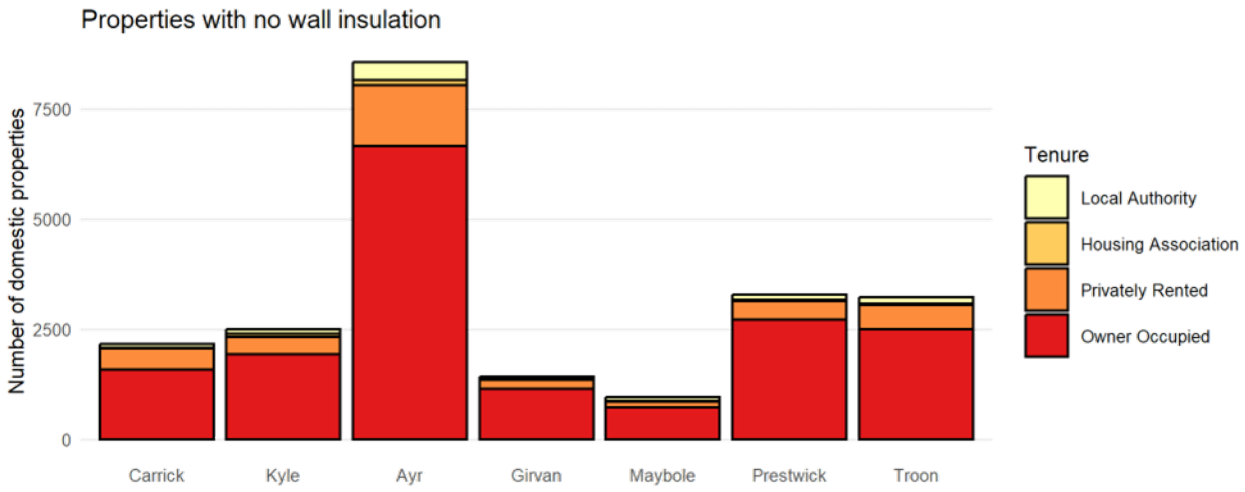


Figure 11: Wall construction in privately rented and owner-occupied houses

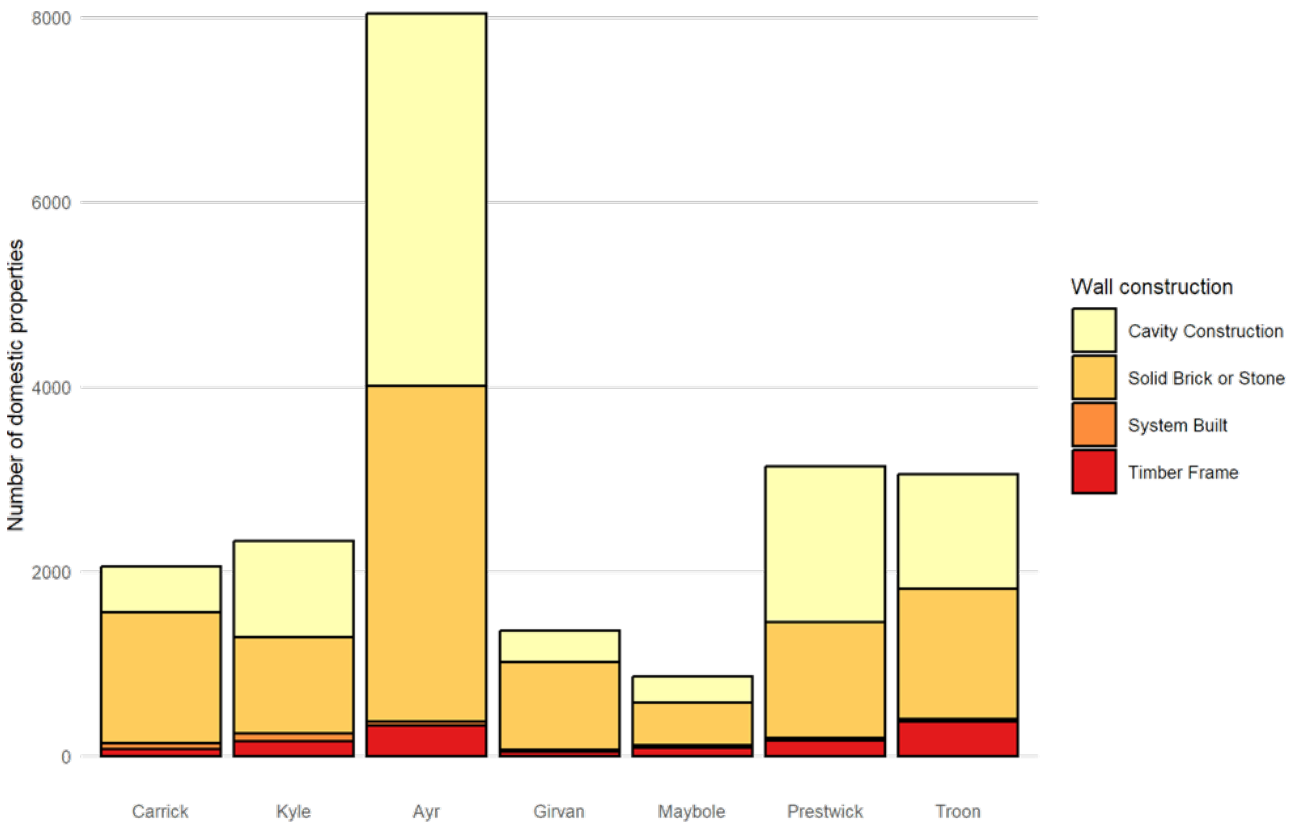


Table 7 shows the breakdown of the effect the energy efficiency interventions have on reducing energy demand across all the South Ayrshire building stock. For reference the baseline heat demand per year for the domestic buildings in South Ayrshire Council is 835,000,000 kWh. This data helps to identify which measures are the most effective way to reduce heating demand, helping both fuel poverty and heat decarbonisation. Loft insulation upgrades is by far the lowest cost method to reduce heating demands. On the other hand, installing external wall insulation on the outside of buildings that already have cavity or internal wall insulation is deemed as the least cost-effective way to reduce heat demand. However, there may be other reasons for doing less cost-effective measures, such as funding streams being allocated only to specific measures or improving the aesthetics of the building with external wall insulation or window upgrades.

Table 8: Summary of energy efficiency interventions across all buildings in South Ayrshire

Measure	Heat Demand Reduction (kWh/y)	Fuel Savings per Investment Cost
Cavity Wall Insulation (CWI)	40,800,000	0.220
Internal Wall Insulation (IWI)	3,400,000	0.113
External Wall Insulation (only wall measure)	37,800,000	0.079
External Wall Insulation (alongside CWI or IWI)	78,400,000	0.023
All wall insulation measures	**160,400,000**	**0.040**
Loft insulation upgrade from <100mm	26,300,000	1.003
Loft insulation upgrade from 100-250mm	64,800,000	0.529
Loft insulation upgrade from 250-300mm	90,500,000	0.227

Measure	Heat Demand Reduction (kWh/y)	Fuel Savings per Investment Cost
All loft insulation measures	**181,700,000**	**0.430**
All Single to Double Glazing upgrade	**6,600,000**	**0.064**
Cylinder insulation upgrade from <50mm	14,500,000	0.216
Cylinder insulation upgrade from 50-80mm	2,000,000	0.110
All cylinder insulation measures	**16,600,000**	**0.192**
All Combined Measures	**365,300,000**	**0.062**

7.5 Domestic Energy Efficiency and Fuel Poverty

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

Carrick and Girvan stand out above the others and the interventions discussed in 7.4 will reduce the scores.

Table 9: 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
Carrick	34 %	43 %	31
Kyle	21 %	7 %	18
Ayr	22 %	9 %	19
Girvan	33 %	21 %	27
Maybole	27 %	15 %	23
Prestwick	18 %	4 %	19
Troon	19 %	4 %	18

7.6 Heat Network Zoning

7.6.1 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” – loads which are large, stable and likely to connect.

To assess these factors, the Scottish Heat Map data was supplemented with data from the Council on fuel consumption within their estate. A data validation exercise was carried out to remove any duplicate points, heat demands which were uncertain (calculation code 1 in Scottish heat map data), dubious heat loads (e.g., too large for the building size or type) and buildings in sectors less likely to enter into commercial agreements. The purpose of this was to ensure that areas identified have as high a chance of being developed as possible.

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 properties, potential sources of heat and areas of future development.

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 a number of industrial buildings where the heat required for space heating had been estimated to be very high and 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 – this 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:

- A baseline scenario (purple shades throughout this analysis) using 4,000 kWh/y/m where the circle around each property (in kWh) is divided by 4,000 to give a radius in metres around the property; and
- A stringent scenario (green shades throughout this analysis) using 8,000 kWh/y/m where the radius of the circle is the heat load in kWh divided by 8,000.

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

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

Finally, the areas were filtered based on whether a continuous area could be formed where the circles around each heat load formed, which enclosed heat loads totalling 15,000 MWh/y or more.

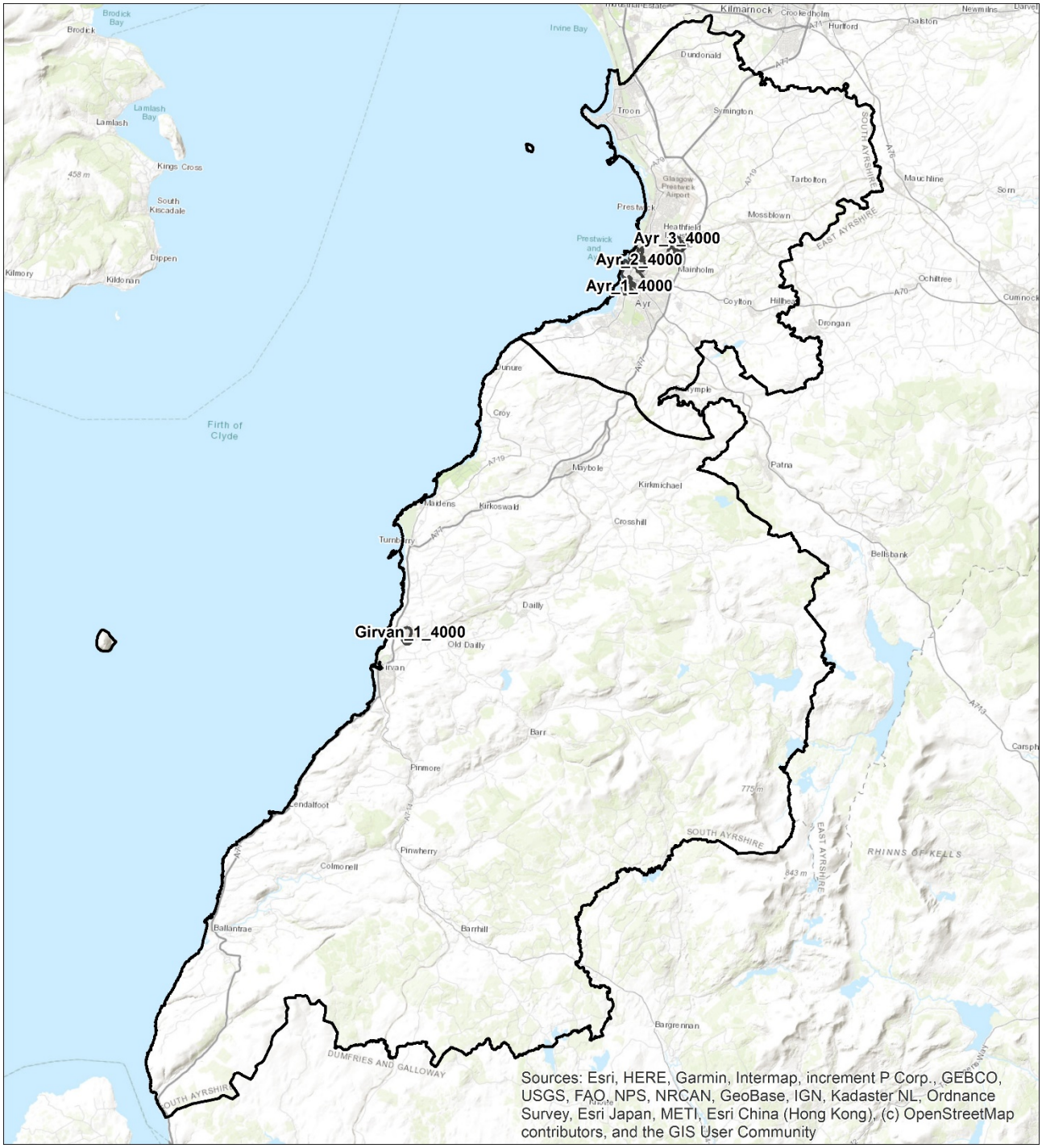
This heat load represents a 3 MW heat source operating for 5,000 full load equivalent hours per year. The purpose is to identify those areas where it is likely that there is sufficient heat load to warrant a new energy centre being constructed. This is intended only as a guide and the exact cost of each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

7.6.2 South Ayrshire Council Overview

An analysis of the potential for heat network zones indicates that there are broadly two areas where heat networks may be viable – within Ayr and an industrial cluster near Girvan.

Within Ayr there are three separate zones identified, however, this strategy considers them in the context of a single heat network strategy for Ayr rather than considering them three discrete opportunities.

Figure 12: South Ayrshire overview of potential heat network zones



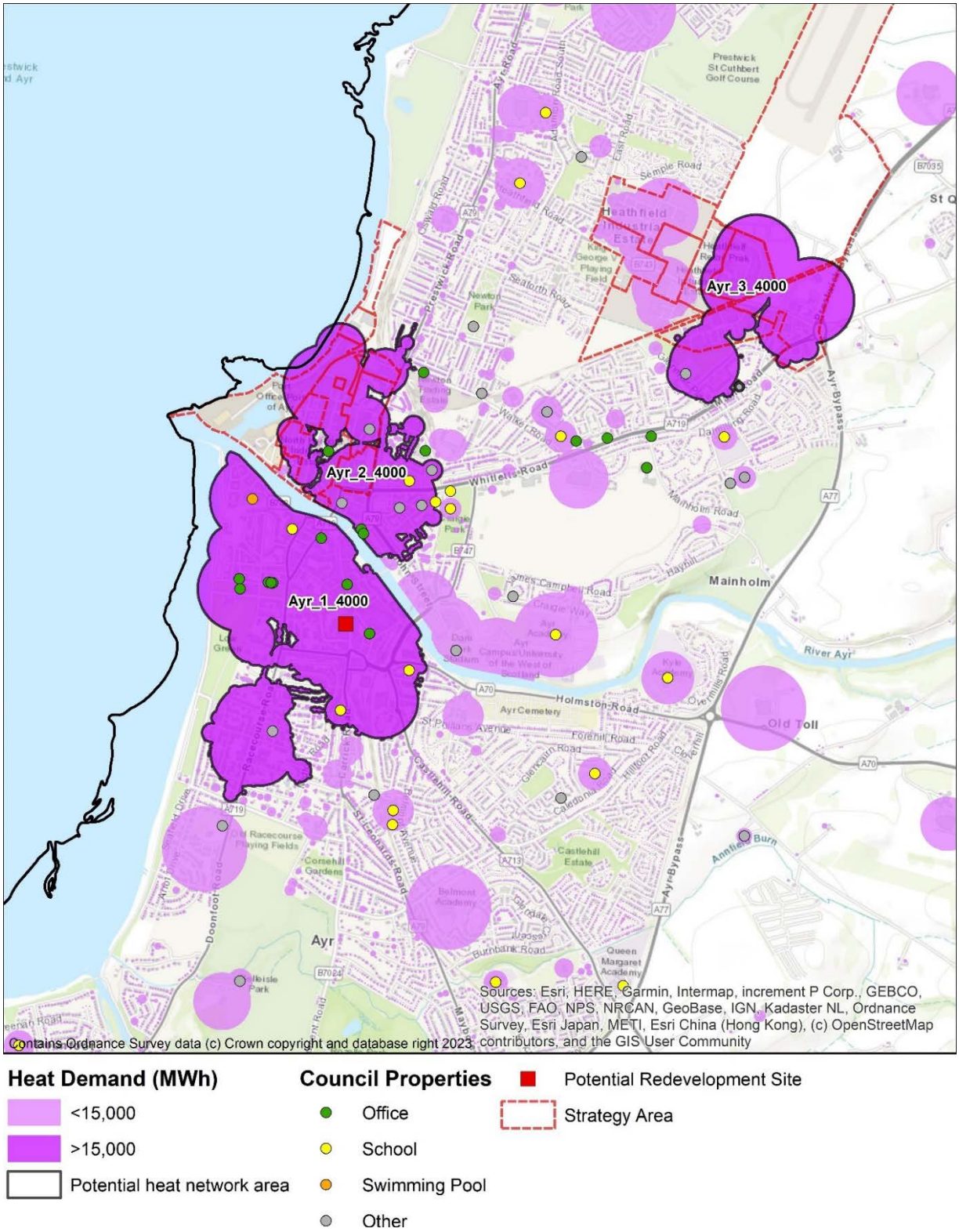
7.6.3 Ayr

The analysis shows that there is a cluster of properties in the town centre, South of the river, which could be considered an area for district heating (Figure 13). This area has both sufficient total load to consider constructing a new network and associated infrastructure, as well as a number of anchor loads including Council owned buildings.

North of the river, there is a heat network area which could be connected to the town centre by one of the bridges crossing the river to form a single heat network opportunity. The business strategy areas highlighted in a red outline are also in this zone and the third to the North East. The Council will coordinate between business and any other party on any actions being planned in this area so that it can be considered as part of any future heat network feasibility study.

A cluster of industrial buildings, Ayr_3_4000. This differs from the town centre areas as there is a less diverse range of tenures and building types and therefore close coordination with businesses is going to be important when considering any heat network development.

Figure 13: Ayr heat network opportunity – Baseline



The Ayr_3_4000 zone is also close to the Prestwick airport site. The Council will coordinate with stakeholders about any future opportunity for heat networks to serve the users of heat on this site.

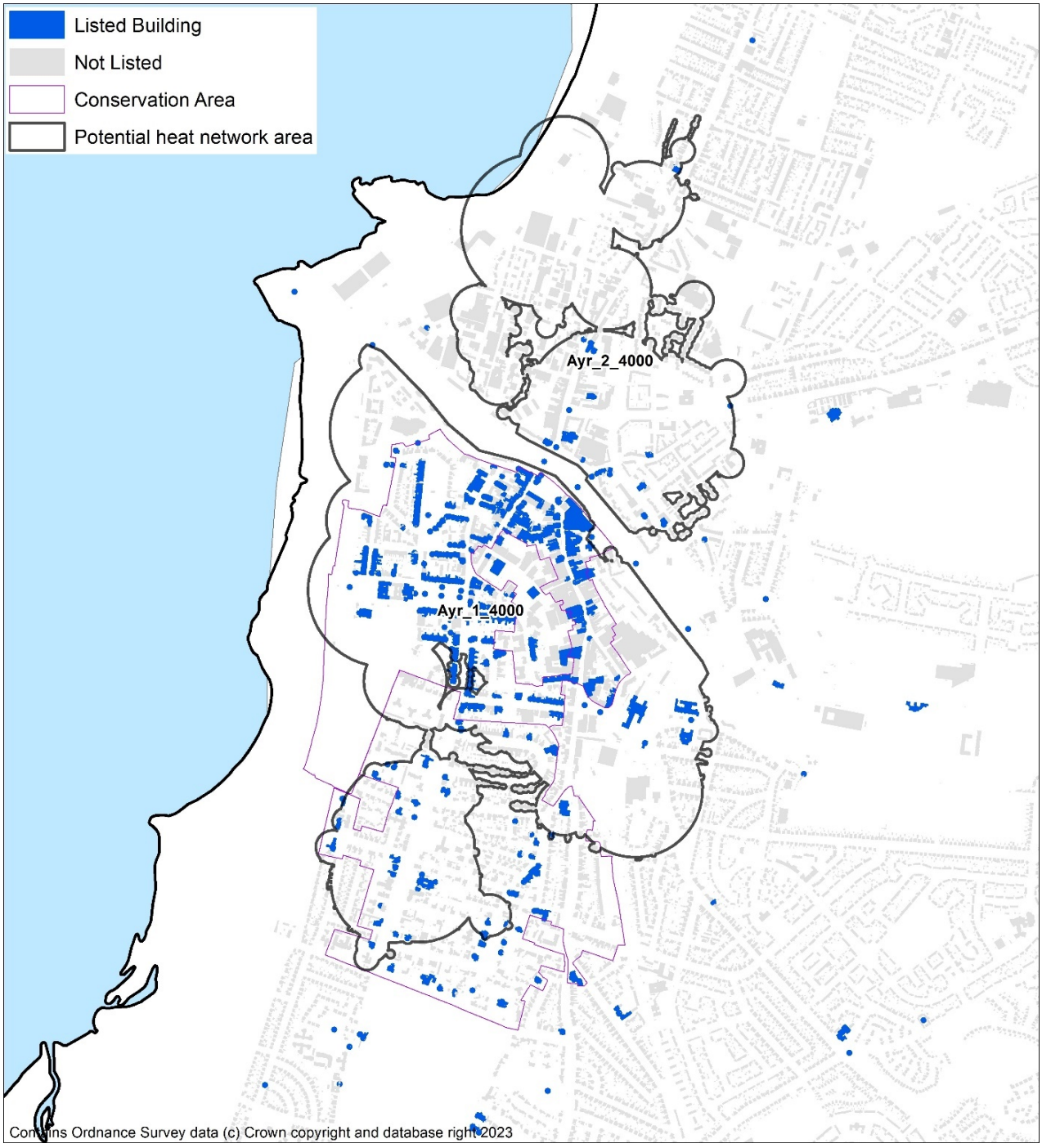
The town centre also contains a large number of listed buildings and a conservation area.

There are additional barriers to decarbonising historic buildings and a heat network could minimise the need for changes to the buildings while ensuring they are decarbonised. Heat networks avoid the need for significant heating plant to be located at each building.

More detailed investigation of each building is important to identify what the opportunities and constraints are for each specific building. Specific attention needs to be paid to:

- whether the existing heating system in the building is likely to be compatible with district heating
- the location of the existing heating plant the route to connect this to the district heating network
- protected attributes of the building and its surroundings

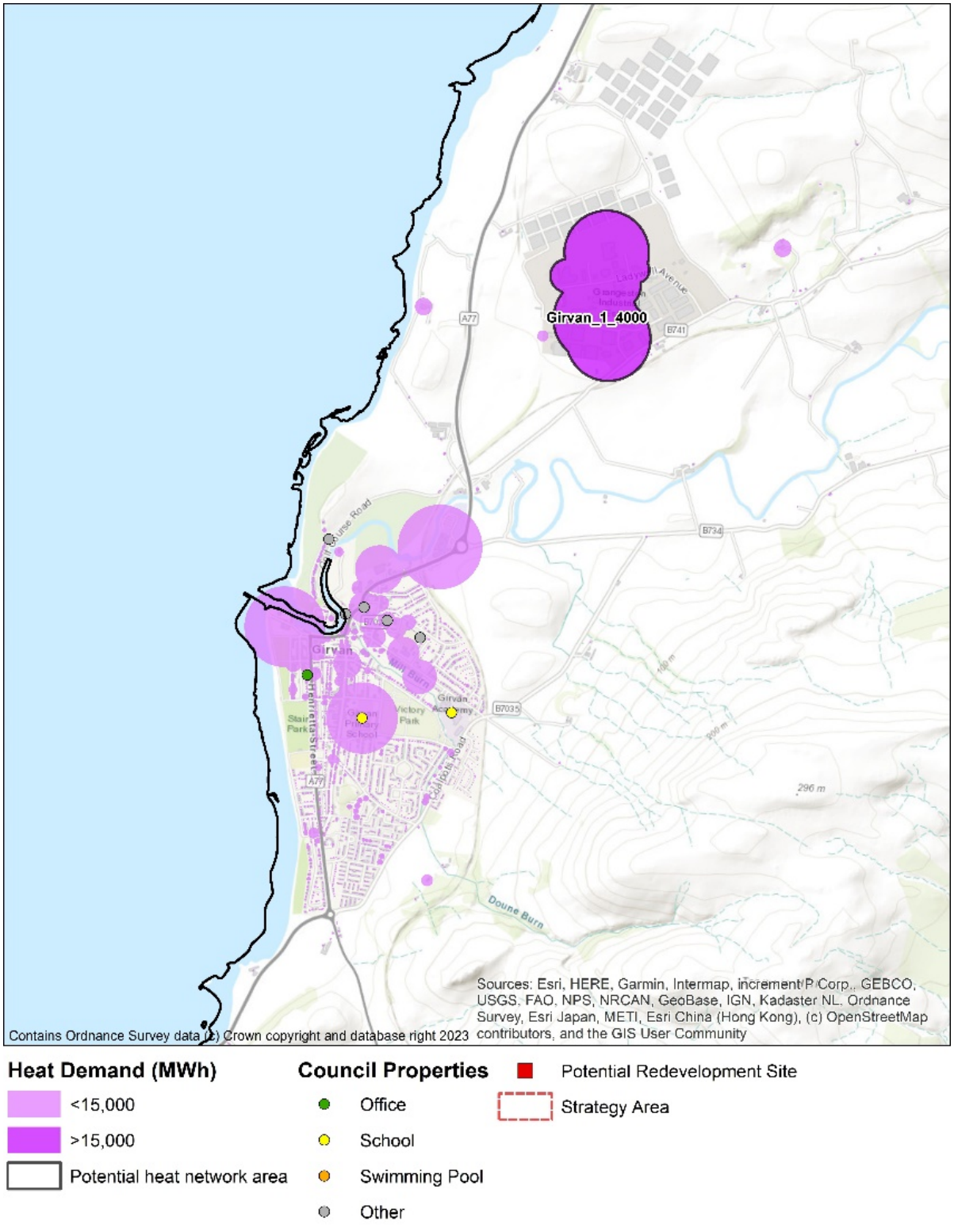
Figure 14 Listed buildings and conservation areas



7.6.4 Girvan industrial cluster

An industrial cluster was identified to the North of Girvan which includes a substantial use of industrial energy including heat. This site has complex energy flows and houses both a Biomass CHP and a substantial anaerobic digestion site and involves a number of industrial businesses. However, a heat network feasibility study determined that there are not currently significant heat demands sufficiently close to the site to allow a district heating scheme to be developed. If significant future developments were to be planned near the site then the opportunity for heat networking could be revisited and local plan zoning may be a lever to influence this. The feasibility study may be revisited in the future.

Figure 15 Girvan industrial heat cluster



It is not within the scope of LHEES to consider other energy vectors, however, the site is in close proximity to the transport corridor containing the A77 connecting the Central Belt of Scotland to the ferry ports of Cairnryan and Larne.

As such, there could be a substantial road transport fuel demand in this area and the site and its energy flows should be considered as part of any future low carbon transport fuels for the area.

7.7 Low carbon heat – other than heat networks

For the majority of properties in South Ayrshire it does not appear that large heat networks will be a viable low carbon heat option. There are a range of other low carbon heating technologies which may be suitable and are discussed below.

7.7.1 Low carbon heating technologies

A list of technologies is outlined in section Table 3.

Each property owner will make decisions on the technology which is suitable for their property. This analysis seeks to predict what will be found to be the most suitable technology and for which property. While heat pumps are likely to be the most suitable heating system (7.7.3), technologies such as electric heating and biomass will be appropriate to some specific properties and other technologies such as hydrogen should not be ruled out entirely at this stage, as they may have a role to play in future LHEES iterations.

7.7.2 Individual or communal heat pump systems

It is possible for a single dwelling to have its own heating system, for a whole building to have a single heat pump system or for many buildings to be connected together into 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 share a single heat source, sometimes referred to as a 5th generation heat network, as having 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, whether it is practical to install an air source or ground source heat pump in a flat depends upon a number of 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 make their own compromises between installation cost, disruption and operating cost. It is usually possible to achieve lower operating costs by using larger radiators. For the purpose of this Strategy a property has been deemed suitable for an individual or communal heat pump system if it is likely to be possible to achieve a good operating efficiency[15].

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 a number of alternative solutions which we have grouped together as “other”.

7.7.3 Assessing suitability for heat pumps

This section estimates how many properties in South 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.

Properties suitable without further upgrades

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 DESNZ Electrification of Heat Demonstration project[16] 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.”[17]

[15] 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.

[16] Electrification of Heat Demonstration Project: winning bids, case studies and project data - GOV.UK (www.gov.uk)

[17] All housing types are suitable for heat pumps, finds Electrification of Heat project - Energy Systems Catapult

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

Of the circa 58,000 domestic properties in South Ayrshire, 28,445 could be suitable already for new heat pumps installations, as shown in Table 9, according to this criterion.

With additional energy efficiency measures

In completing the more cost-effective energy efficiency measures, the number of heat pump suitable properties increases to over half across the local authority. The reduction in heating demand from those energy efficiency improvements has the 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.

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 5,000 properties to be classed as suitable for heat pumps by these measures.

Other factors limiting suitability

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 35,000 kWh/y of heat demand. With both factors considered together, Table 9 shows the overall number of properties that are currently suitable for heat pumps.

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 10: Heat pump suitability

Heat Pump Suitability	Currently	Cost effective energy efficiency measures <160kWh/m^2/y	All energy efficiency measures <160kWh/m^2/y
No. of Properties <160kWh/m^2/y	28,445	37,708	42,647
No. of Properties <35,000kWh/y	56,776	57,592	57,641
<160kWh/m^2/y and <35,000kWh/y	28,441	37,707	42,646

This leaves around 15,000 properties less likely to be suitable for heat pumps, according to these rules of thumb, but there are other options 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.

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.

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. Biomass boilers or heating system 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 need to be treated on a case-by-case basis beyond the scope of this Strategy.

Hard to treat properties which already have heat pumps

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

There are 182 properties which already have a heat pump, have a heat demand over 160kWh/m the data is based on an EPC, there are a further 53 where the data in home analytics is estimated.

This suggests that there are properties which have solved the problems associated with designing and installing heat pumps in these properties have been solved.

There may therefore be an opportunity to both learn from these installations and to increase the number or properties considered suitable in future iterations of this Strategy

7.8 Mixed Tenure, Mixed use and Historic

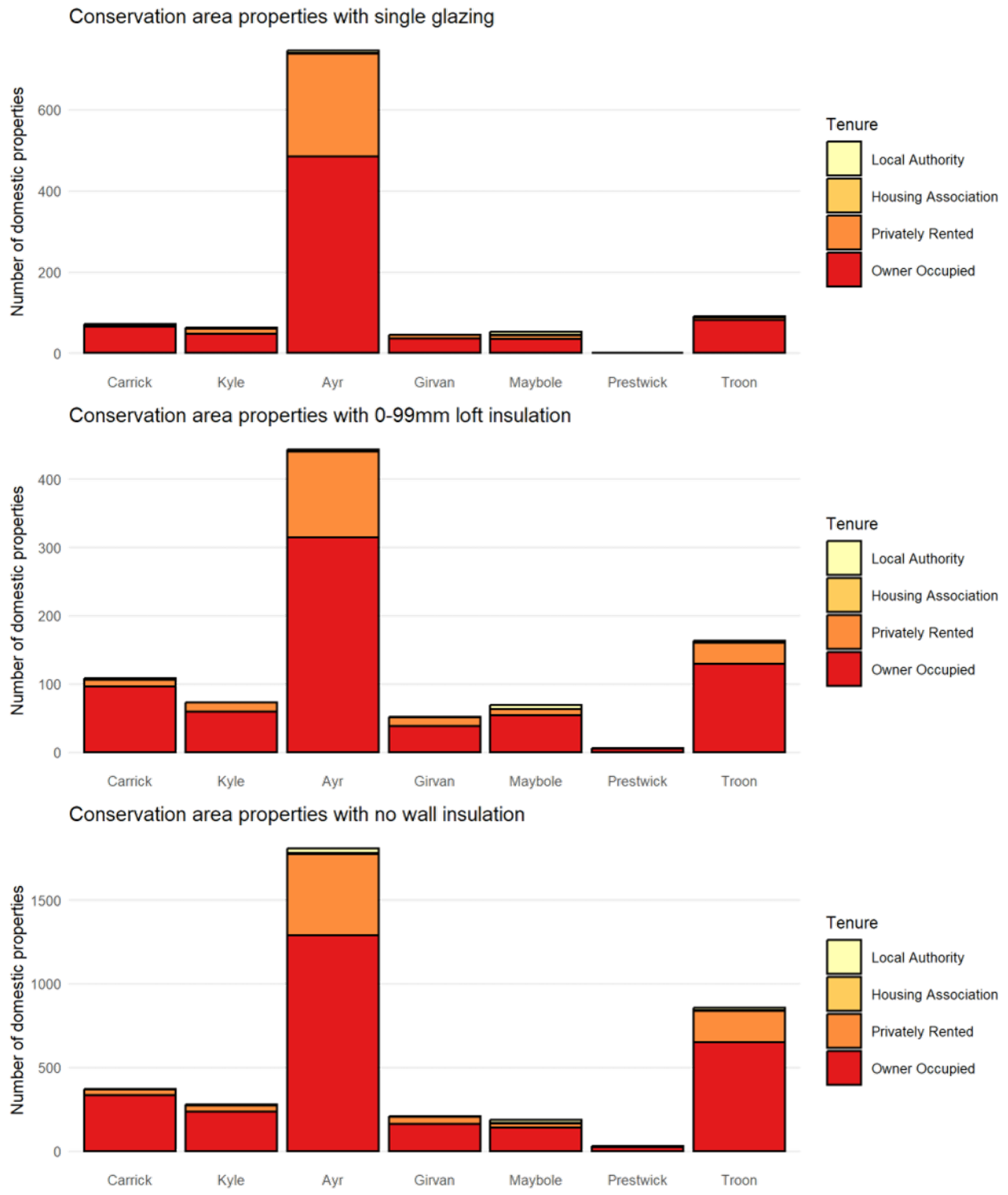
Listed buildings can be challenging with respect to energy efficiency improvements, the siting of, for example, air source heat pumps external to the building, and the connection to new district heating pipework.

There are around 1,350 listed domestic properties (data for non-domestic has not been provided). Only 19 % have EPCs rated C or better, with 14 % being F or G. This is less favourable than typical (Figure 2) but not extreme.

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

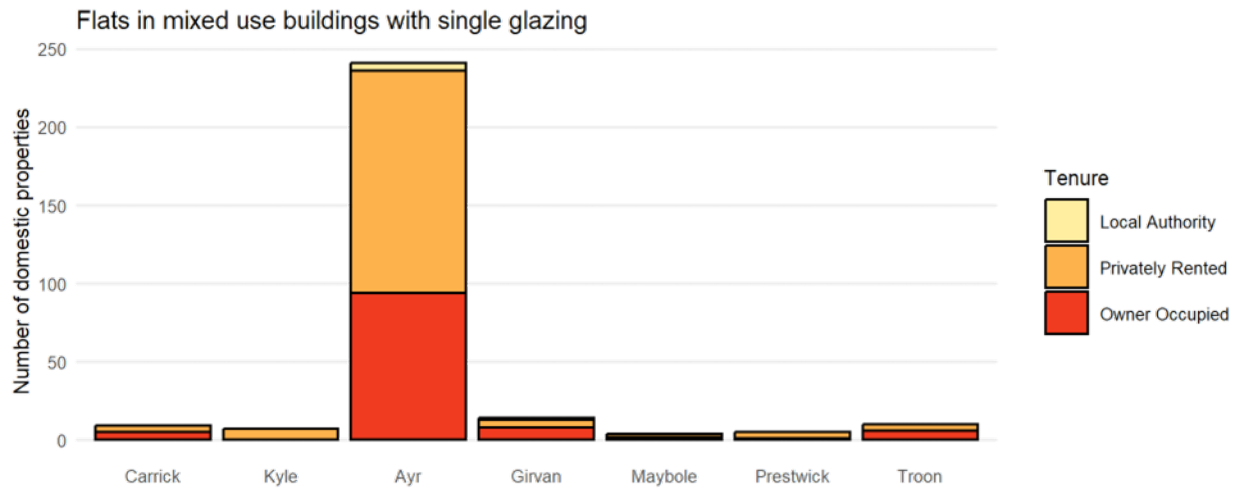
The energy efficiency intervention data in Figure 10 has been revisited with a focus on properties in conservation areas- see Figure 16. There are a little over 4,600 domestic properties in conservation areas (around 8 % of the homes in South Ayrshire), with the vast majority being owner occupied.

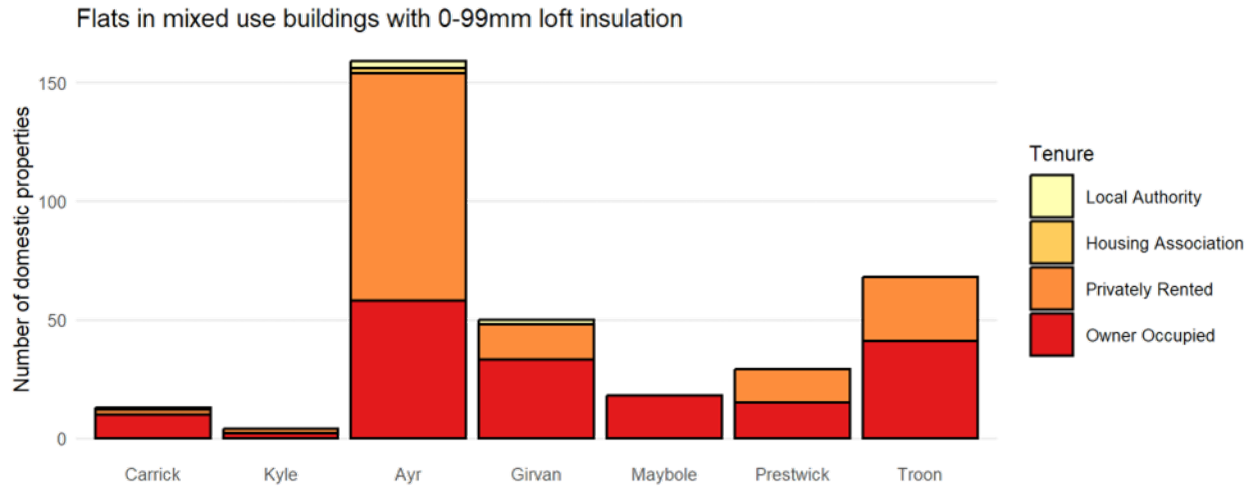
Figure 16: Conservation area properties requiring upgrades to glazing, and loft and wall insulation

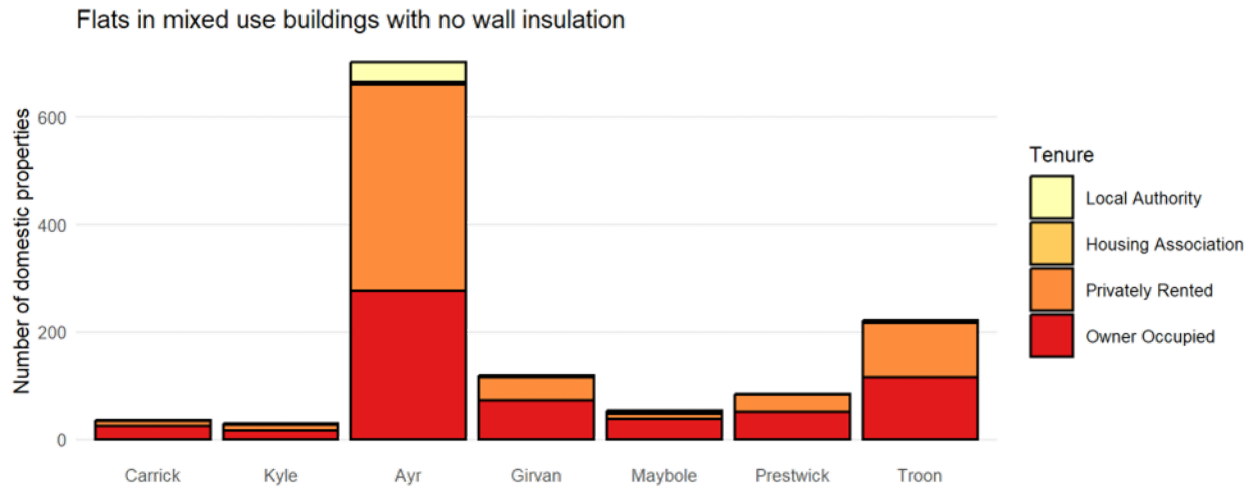


Around 1,700 domestic properties (3 %) of total are recorded as flats in mixed use buildings. The potential energy efficiency interventions for these properties are laid out in Figure 17. Almost all of these properties are owner occupied or privately rented. As with the general stock, wall insulation appears to be a big target for this typology.

Figure 17: Domestic properties in mixed use buildings requiring upgrades to glazing, and loft and wall insulation







7.9 Building-Level Heat Decarbonisation

To decarbonise and reduce fuel poverty across the region Table 10 shows how each key measure can contribute to each locality.

Due to the relatively low heat demand density across most of South Ayrshire potential district heating opportunities are limited to around 9.2% 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 0. 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 11: Impact of measures on domestic buildings by Locality

	Properties	Current Heat Demand (kWh/y)	Potential Heat Network Properties	Suitable for a Heat Pump	Not Suitable for a Heat Network or Heat Pump and Not Using Biomass	Not suitable for Heat Network or Heat Pump (%)
All South Ayrshire	57,900	835,034,000	5,304	43.434	13,386	23 %
Ayr	24,400	334,935,000	5,304	19,040	4,239	17 %
Carrick	3,900	78,227,000	-	2,109	1,811	46 %
Girvan	3,500	51,841,000	-	2,483	985	28 %
Kyle	8,300	123,566,000	-	6,051	2,268	27 %
Maybole	2,300	30,381,000	-	1,717	591	26 %
Prestwick	7,400	108,928,000	-	5,841	1,598	21 %
Troon	8,100	107,155,000	-	6,193	1,894	23 %

8. Delivery Areas

8.1 Spatial Approach

8.1.1 Purpose

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

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

The analysis set out in this report is conducted a higher spatial granularity than in the Strategy to allow targeting of delivery actions.

8.1.2 Domestic Energy Efficiency

The attributes of each home were taken from the Home Analytics data; this contains information on the construction of each building and the suitability 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 I. 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 Weighted Scores are distributed unevenly across South Ayrshire with higher scores indicating poorer energy efficiency and a greater potential for demand reduction (Figure 18, Figure 19 and details in Table 20 in Appendix D). There are a small number of zones with significantly worse scores, suggesting that there is value in addressing energy efficiency measures in specific geographical areas.

Clearly, those Areas with the highest scores are a priority but, amongst the top scorers, most homes are in the private sector and, therefore, not under South Ayrshire Council's control. This points to a need to address the problems both by this spatial zoning and by targeting properties by tenure and technical intervention; for example, a possible lack of wall insulation is the biggest contributing factor to the Weighted Score in each top Delivery Area.

Figure 18: Map of Weighted Energy Efficiency Score – Data Zone Level

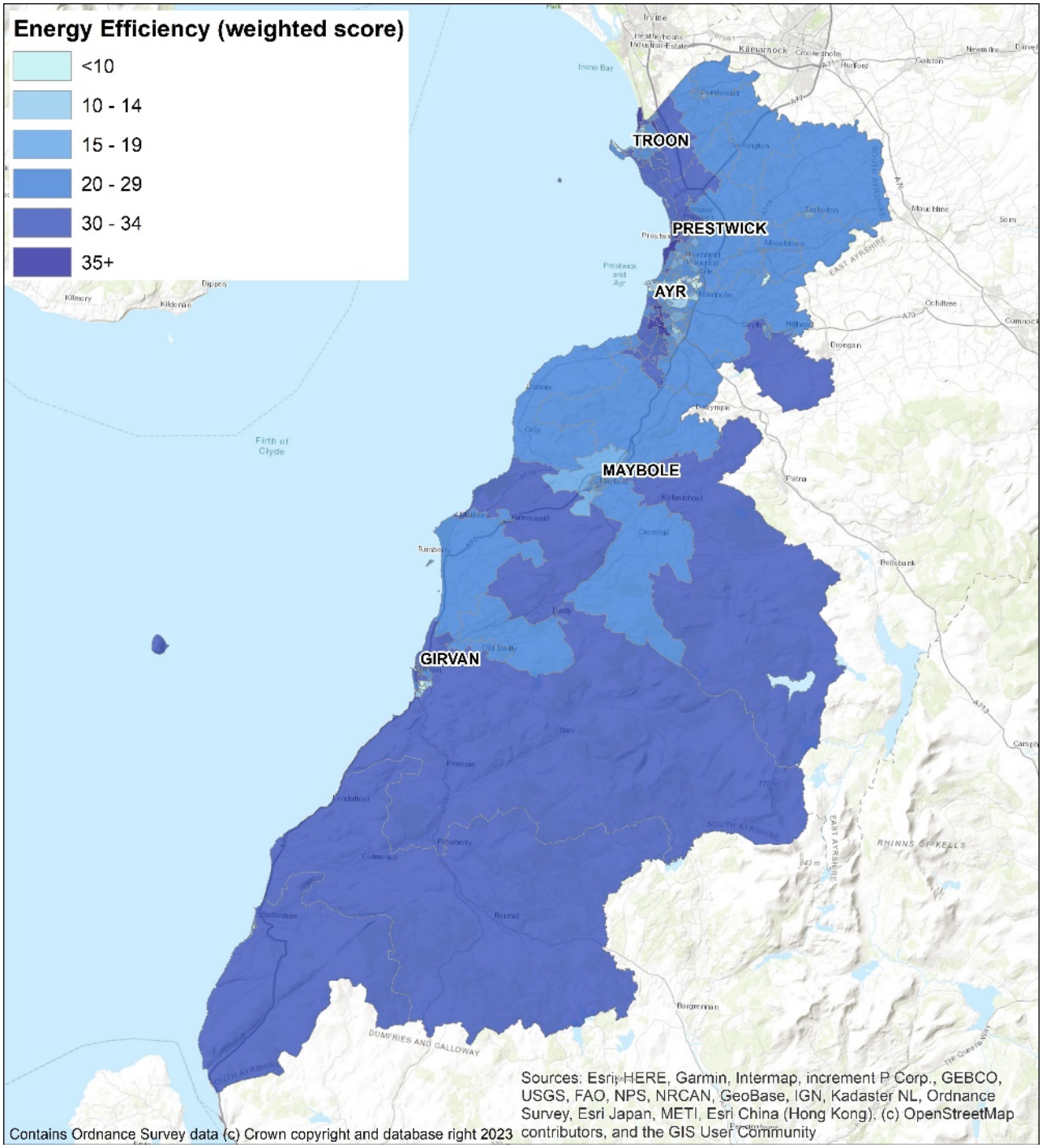
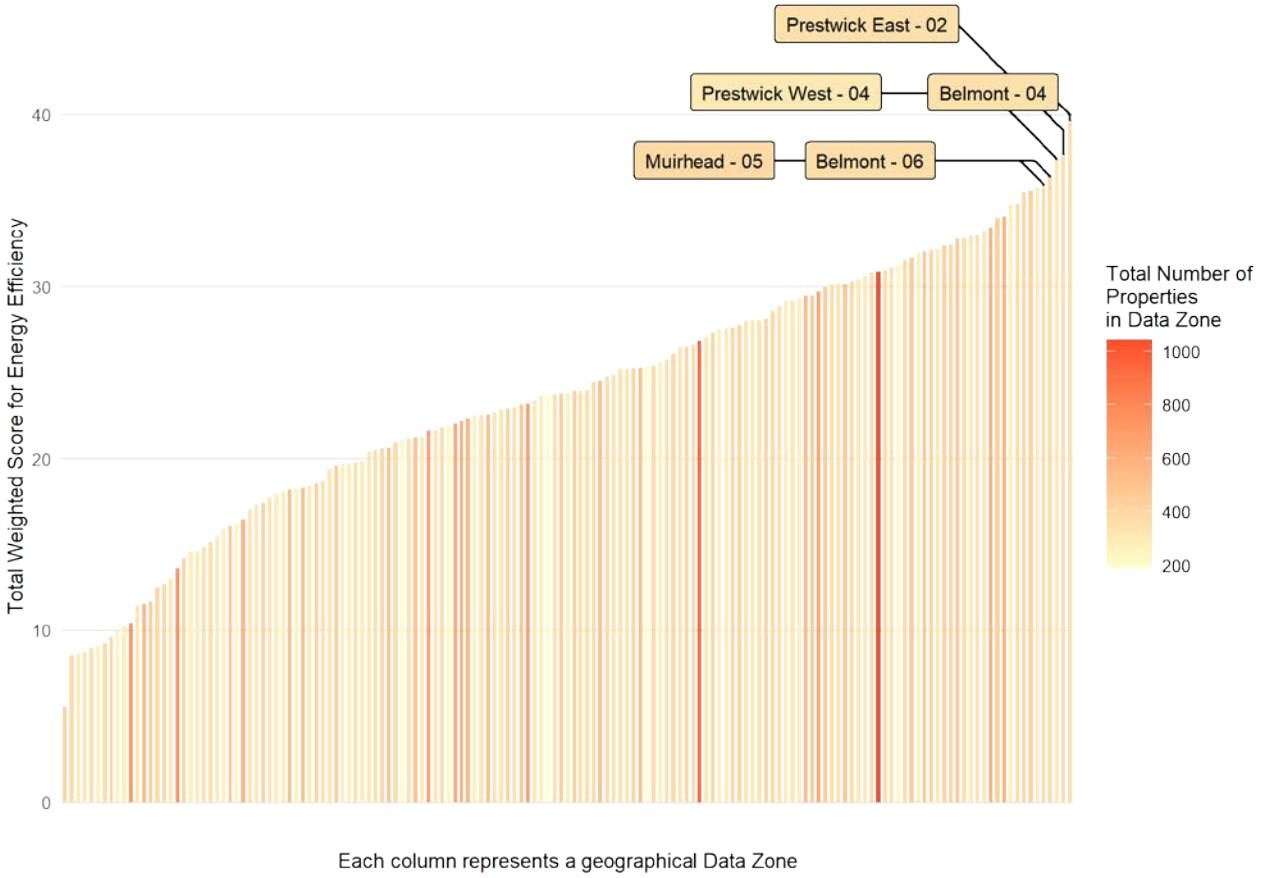


Figure 19: Histogram of Weighted Energy Efficiency Score – Data Zone Level



8.1.3 Energy Efficiency as a Driver for Fuel Poverty

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

The Weighted Scores are distributed unevenly across South Ayrshire (Figure 20, Figure 21 and details in Table 21 in Appendix D), with higher scores indicating a greater risk that families are experiencing fuel poverty as a result of poor energy efficiency. There are a small number of zones with significantly worse scores, suggesting that there is value in addressing energy efficiency measures in specific geographical areas.

Figure 20: Map of Energy Efficiency as a Driver of Fuel Poverty – Data Zone Level

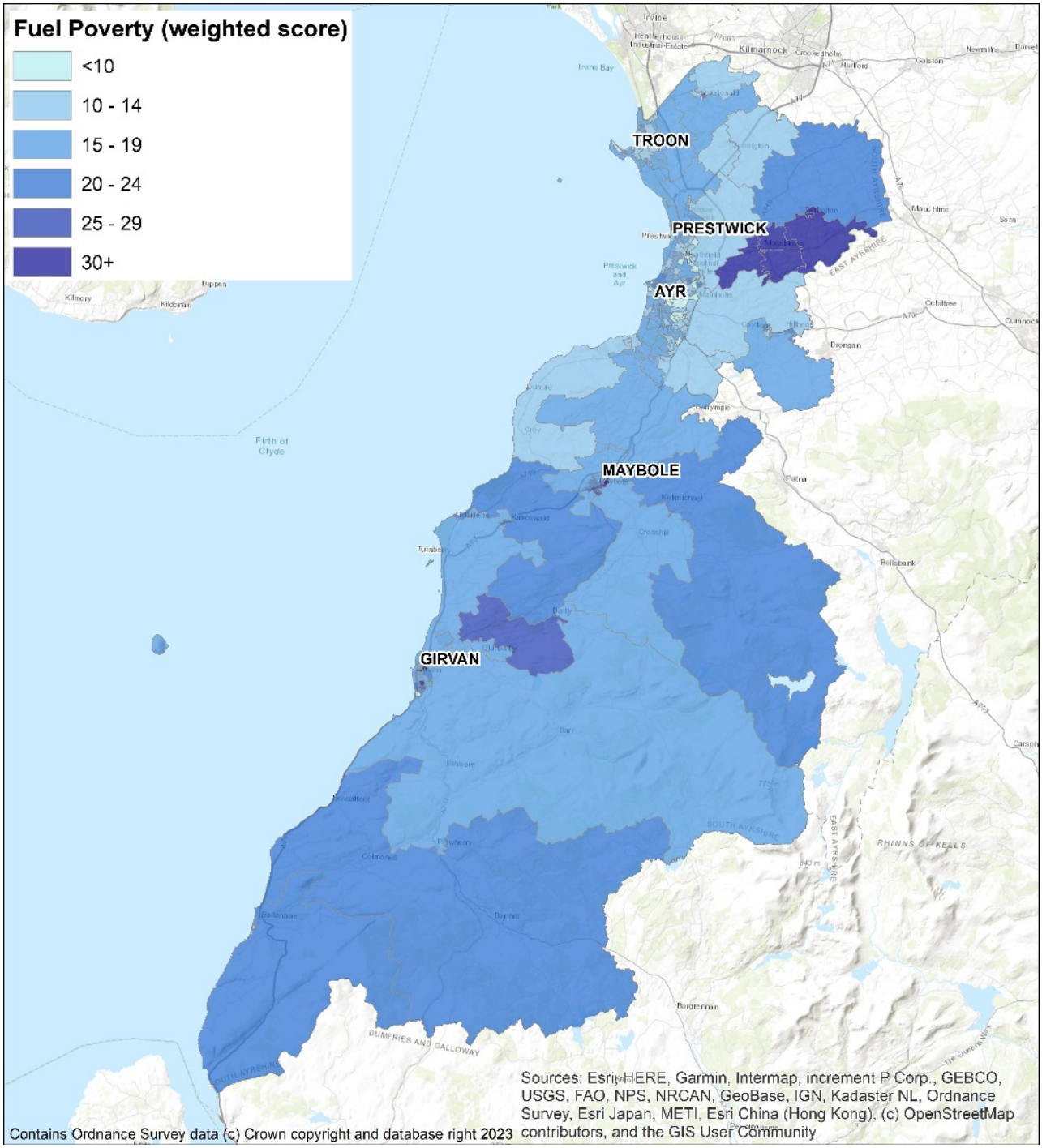
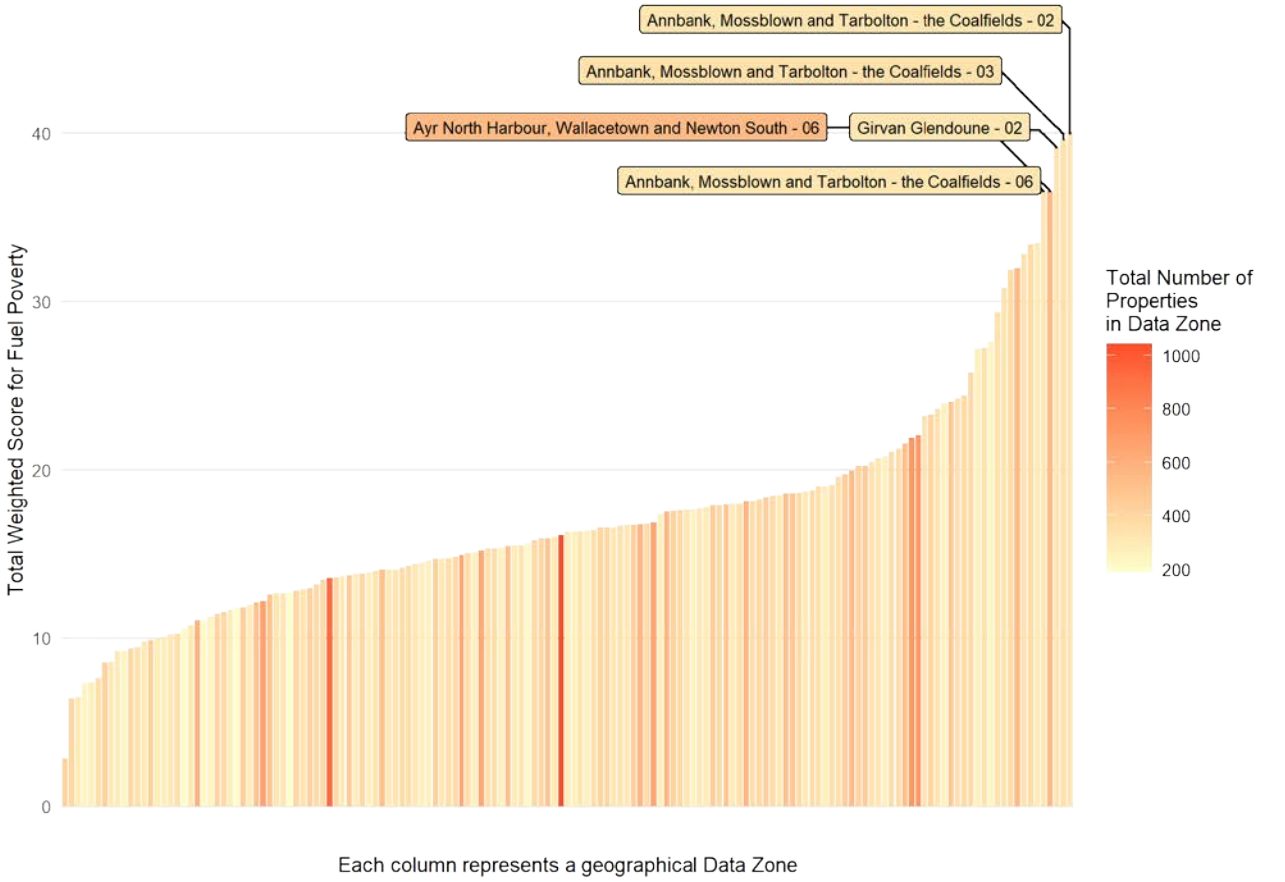


Figure 21: Histogram of Weighted Fuel Poverty Score – Data Zone Level



8.1.4 Mixed-Tenure, Mixed-Use and Historical

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

8.1.4.1 Mixed-Tenure

It is apparent that there is a wide variation in the number of mixed-tenure buildings between data zones (Figure 22 and Figure 23). This ownership type will require specialised engagement, funding and delivery strategies in order to implement the necessary energy efficiency measures. The technical solutions themselves will also potentially differ, since this group includes the range from high flats to sandstone tenements. A dedicated working group to resolve the unique challenges of mixed-tenure buildings may be the best course of action to make progress on the properties that may have multiple stakeholders and heating profiles. The prioritisation of zones will be dependent on the prioritisation identified for energy efficiency measures as much as on the order presented here.

Figure 22: Map of Mixed-Tenure Properties – Data Zone Level

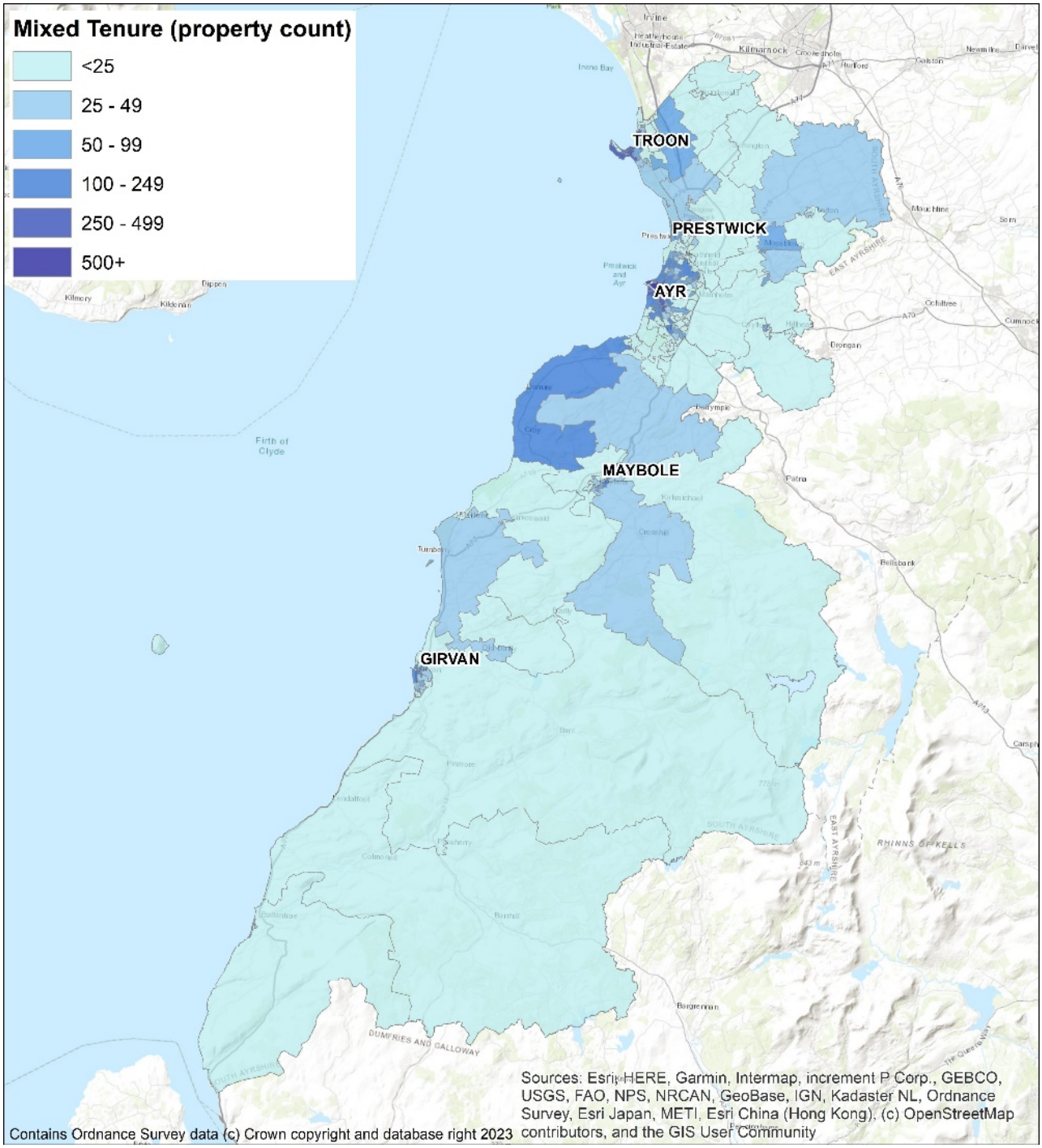
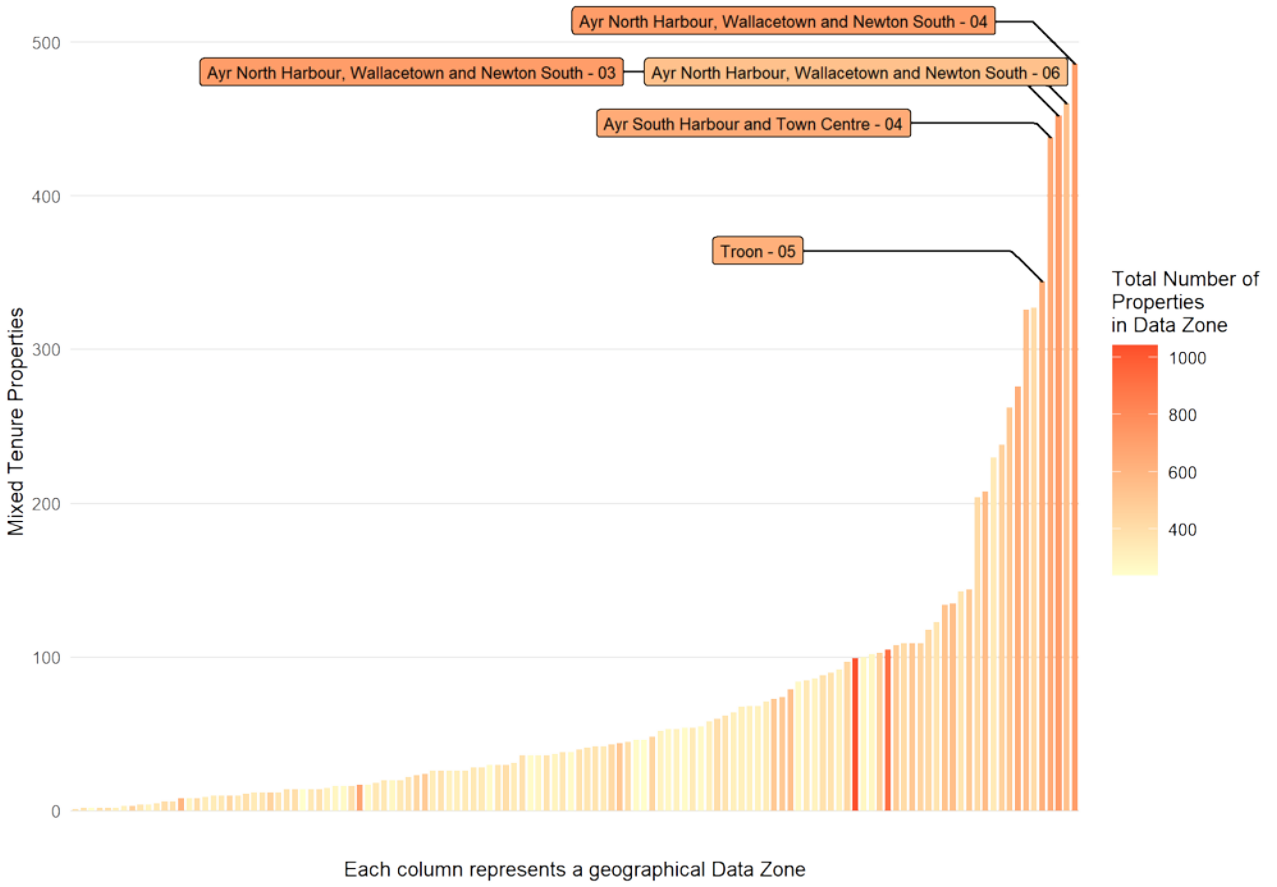


Figure 23: Histogram of Number of Mixed-Tenure Buildings – Data Zone Level



8.1.4.2 Conservation Areas and Listed Buildings

Relatively few Data Zones have homes within conservation areas (Figure 24). The top three zones (Figure 25) also appear amongst the worst performing Zones according to Energy Efficiency Score and so it is clear that properties in at least some conservation areas will be priorities and that appropriate solutions for these areas will need to be rolled out early in the LHEES delivery period.

Figure 24: Mapped Domestic Properties within Conservation Area by Data Zone

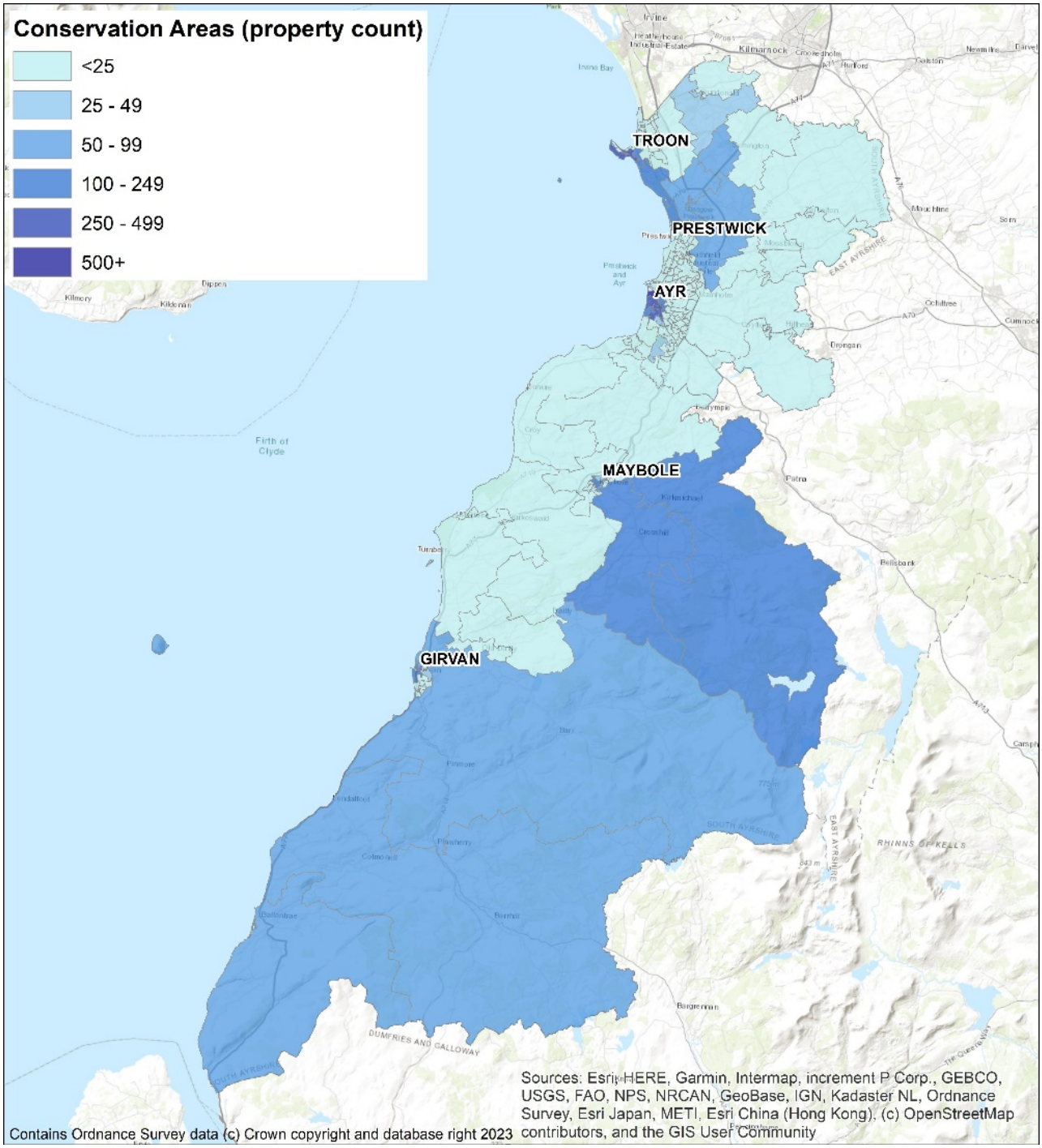
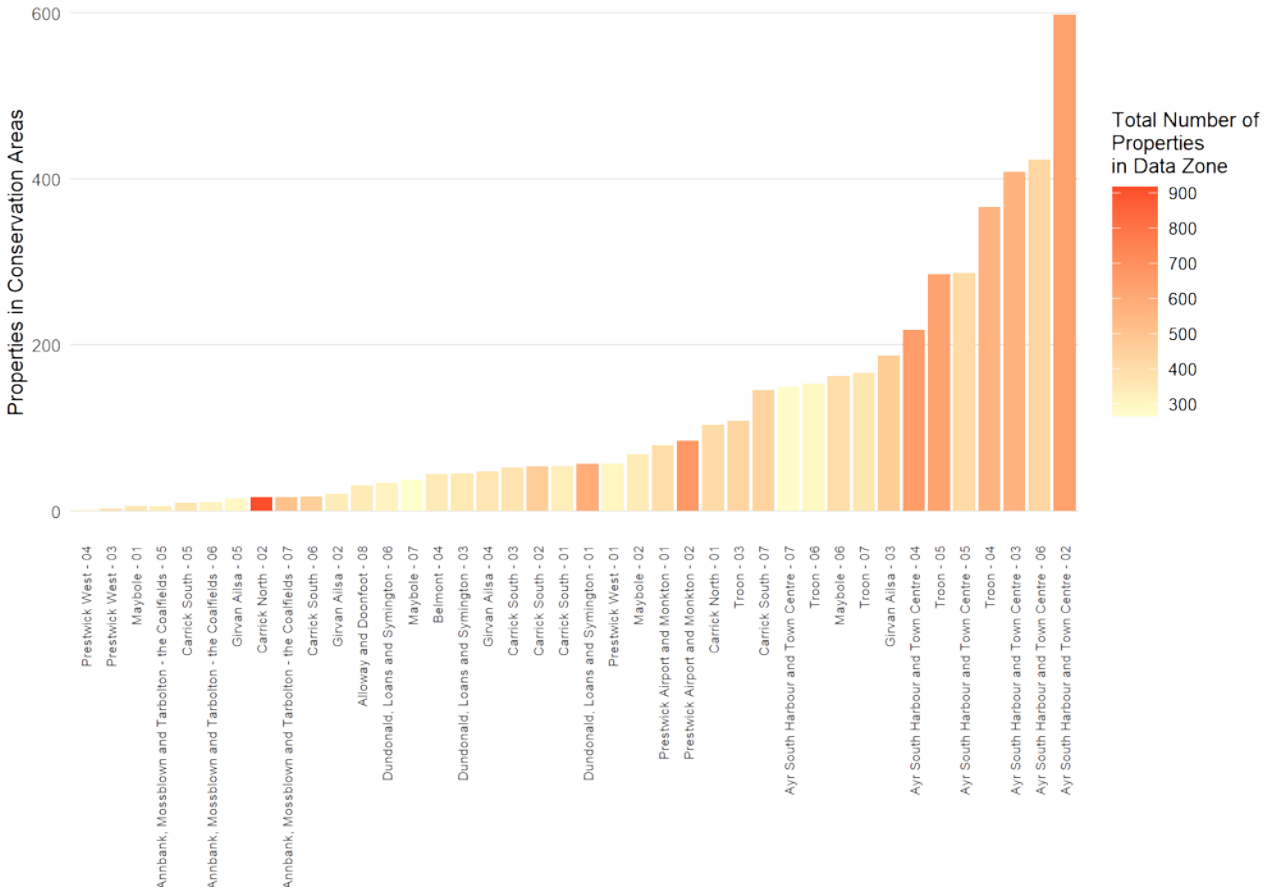


Figure 25: Domestic Properties in Conservation Areas by Data Zones Histogram



Again, there are a reasonable number of domestic properties (Figure 26 and Figure 27). The top four data zones are also amongst the poorer performers from the point of view of energy efficiency. Consequently, as in the conservation areas, the special strategies for this building type will have to be delivered early in the LHEES delivery phase.

Figure 26: Mapped Listed Domestic Properties by Data Zone

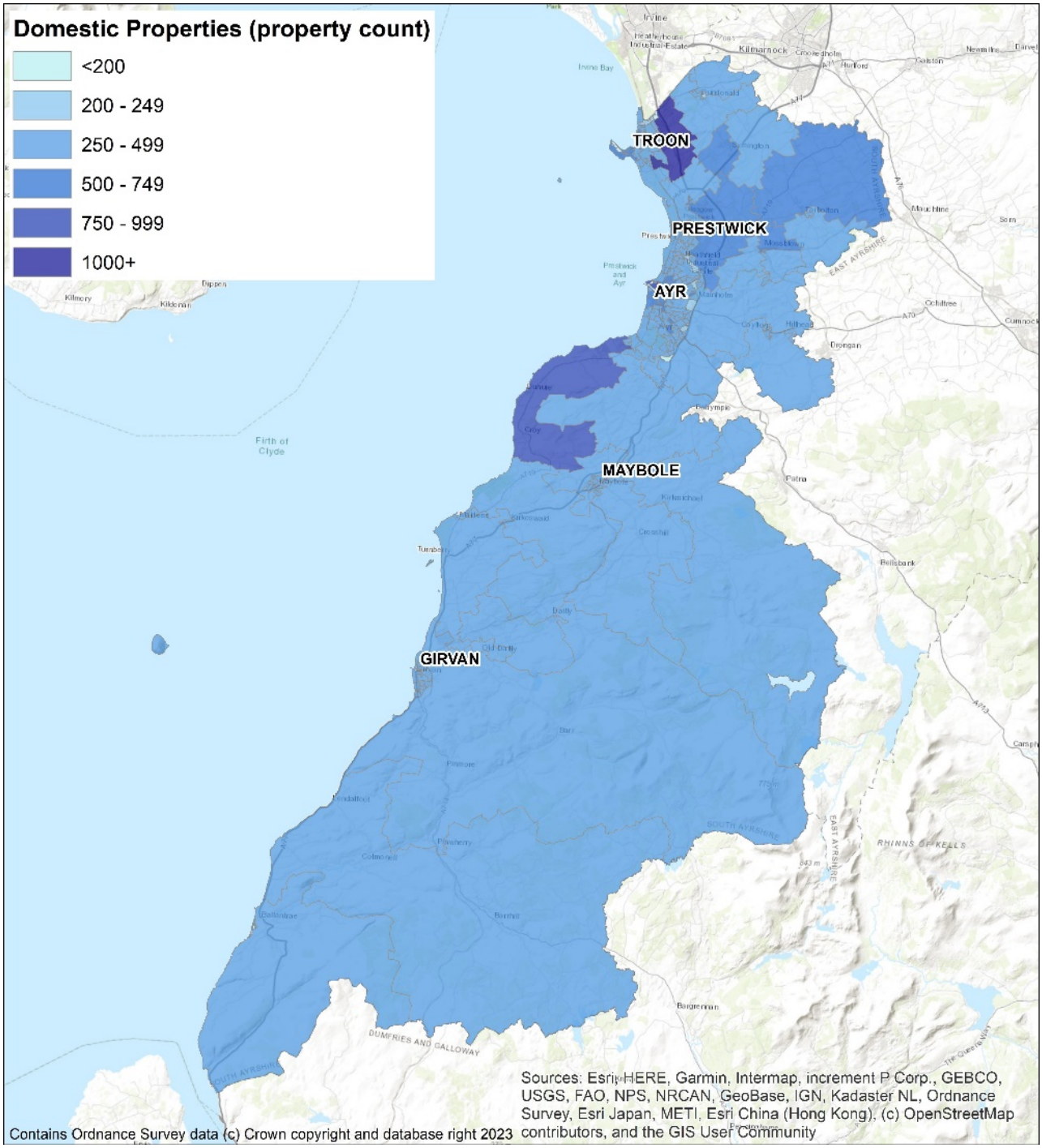
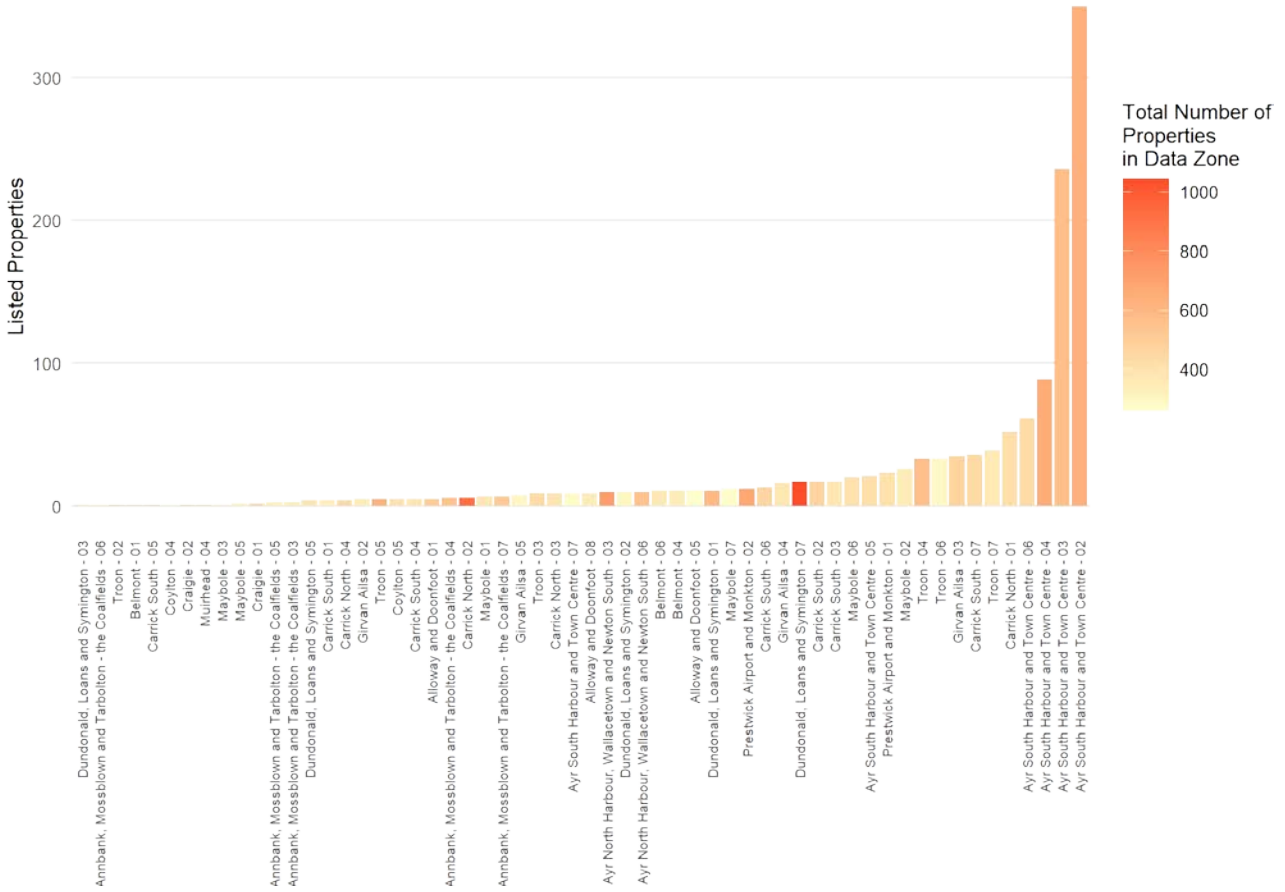


Figure 27: Listed Domestic Properties by Data Zone Histogram



8.1.5 Fuel Poverty – Absolute

The fuel poverty indicator analysis used in the baseline tool was supplemented with additional analysis based on the heat demands and fuel type presented in the Home Analytics dataset and the subsequent cost to the heat each property based on the utility prices given in Table 11. This building-level analysis was aggregated to intermediate zone and is intended to provide an indication of how affordable it is to heat houses in each area and is not a detailed prediction.

Table 12: Fuel prices used in fuel poverty analysis

Fuel	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	£0.45
Electricity	£0.27

The number of homes in each income decile are given in Table 12; 60 % of homes are in decile Five or lower. The 10 least affordable Intermediate Geography Zones, those with the fewest percentage of homes which could be affordably heated by households in income decile Five or lower, are listed in in Table 13.

Table 13: Number of homes by SIMD income decile

SIMD Income	Number of homes	Percentage of homes by income decile
One	5,920	10%
Two	4,960	9%
Three	4,080	7%
Four	9,980	17%
Five	9,790	17%
Six	2,840	5%
Seven	4,430	8%
Eight	4,230	7%
Nine	7,250	13%
Ten	3,840	7%

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

Strategic Zone	Percentage of homes which could be heated by households in income decile five or lower without being in fuel poverty
Carrick	18 %
Kyle	60 %
Girvan	73 %
Ayr	74 %
Prestwick	74 %
Troon	78 %
Maybole	84 %

8.1.6 Social Impact of Multiple Deprivation

The Local Heat and Energy Efficiency Strategy and Delivery plan consider fuel poverty where it can be reduced through energy efficiency measures. Understanding which locations have higher rates of overall deprivation as well as specifically income deprivation, can inform decisions on areas of focus.

Figure 28: Map of overall SIMD rank

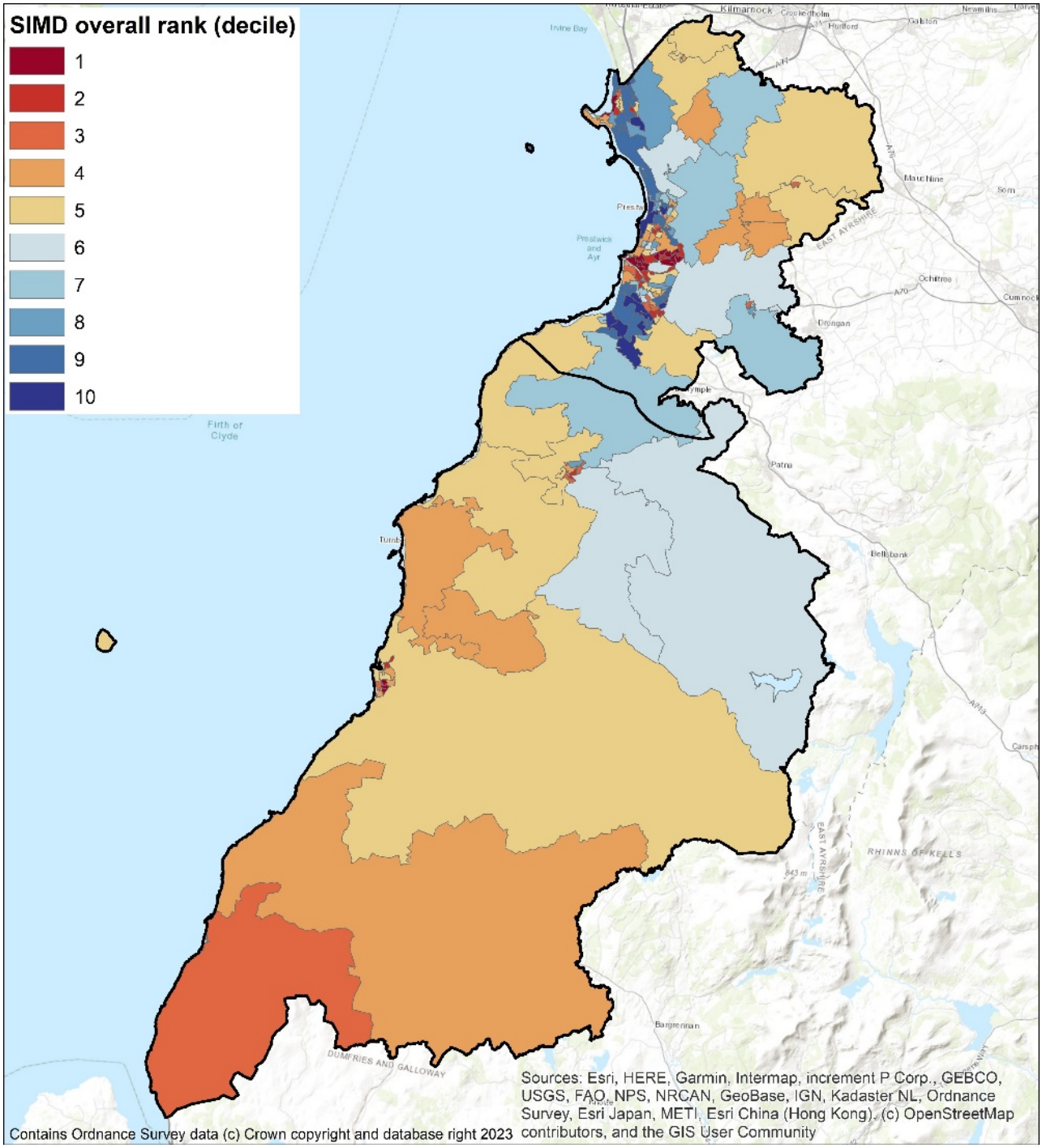
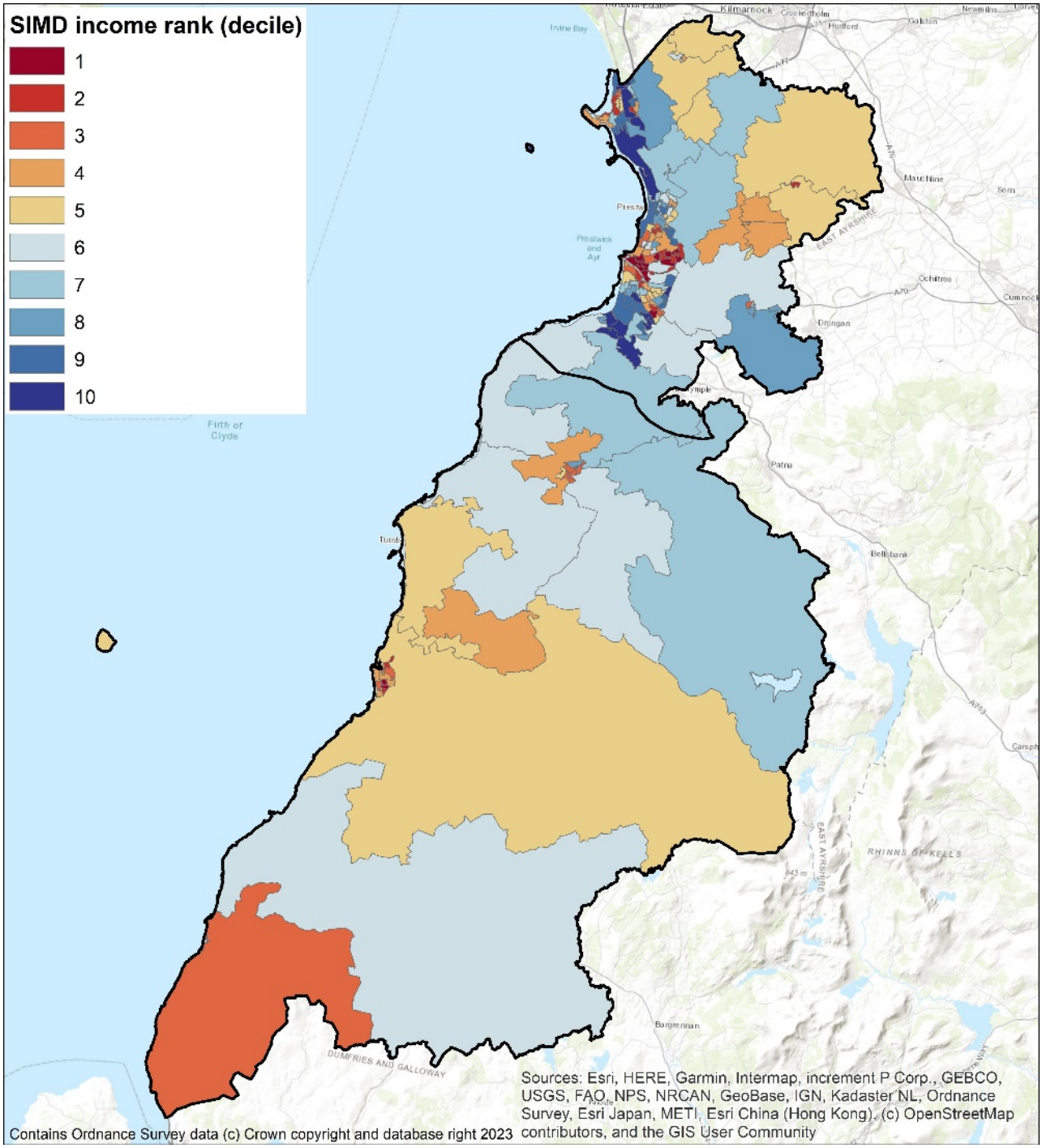


Figure 29: Map of income SIMD rank

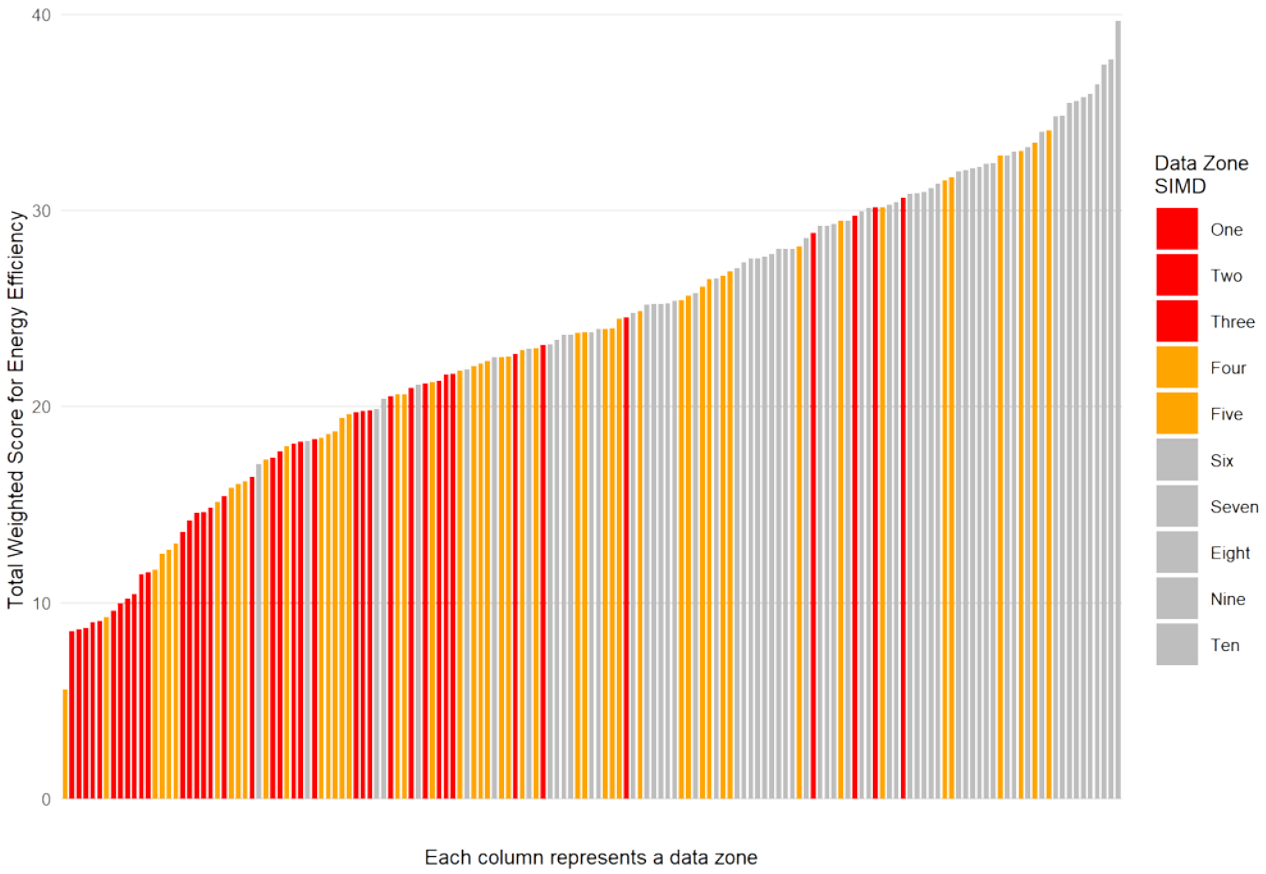


8.1.7 Overlaying Multiple Considerations

The analysis has generated various rankings for the purpose of determining where to start with interventions. The Weighted Energy Efficiency Score and Fuel Poverty rankings are, thanks to the latter being based on the former, very highly correlated and could be used interchangeably with similar outcomes. However, SIMD and income ranks are not correlated at all with the Weighted Energy Efficiency Score. Figure 30 highlights that the data zones with the worst energy performance are ones which are relatively affluent, so addressing funding towards fuel consumption reductions would not universally address the issue of real-world fuel poverty. However, since there are likely to be income poor households in areas which are more affluent on average, the poor energy efficiency of those properties or the relative lack of energy efficient properties could still warrant targeted intervention.

These observations suggest that prioritisation approaches need to take account of multiple factors, addressed in 8.2.3.

Figure 30: Data Zones ranked by Weighted Energy Efficiency Score and coloured by SIMD rank



8.1.8 Heat Pump Suitability

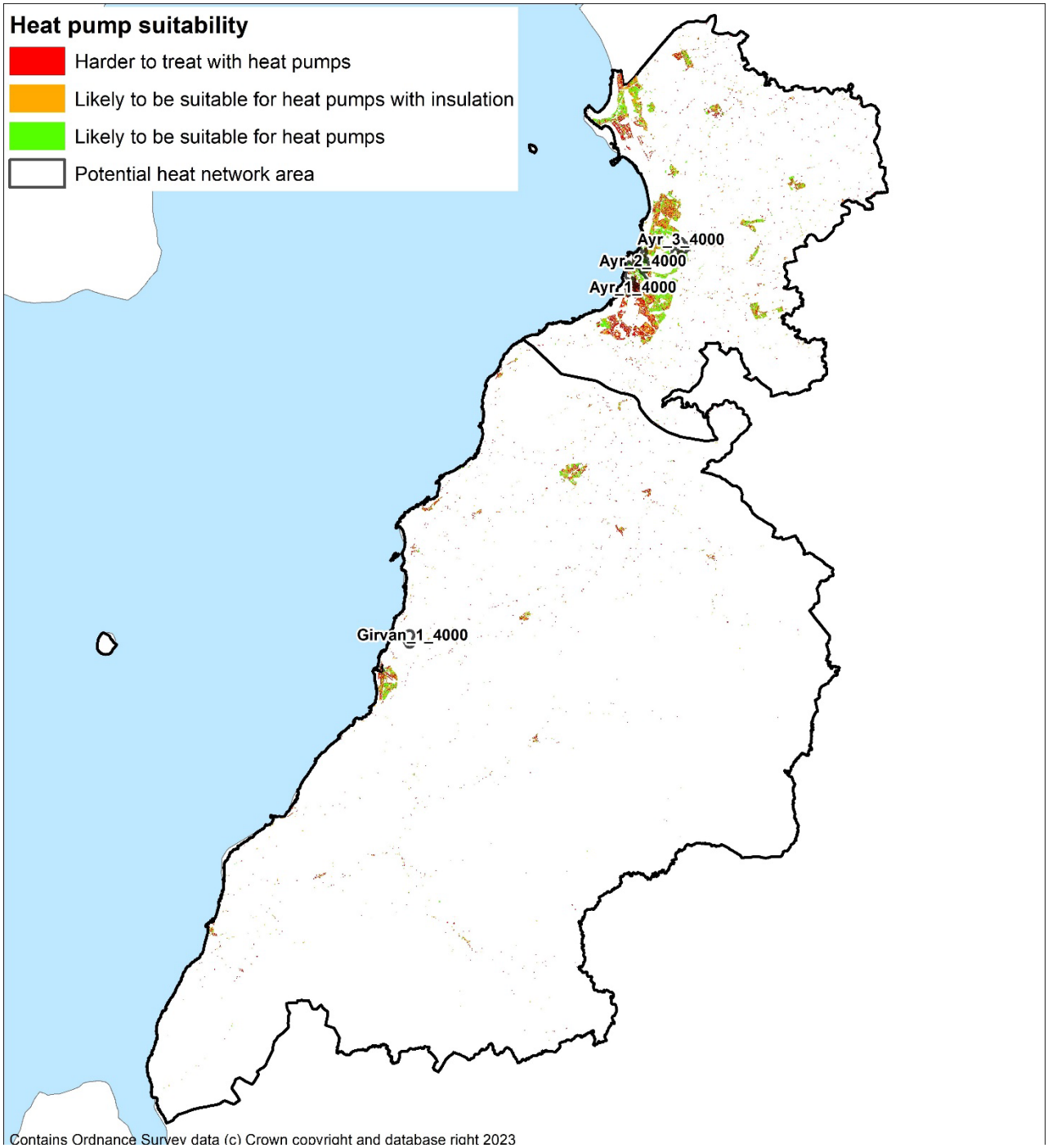
This section highlights where there are significant proportion of properties where there is a greater challenge with implementing a heat pump solution, even after reasonable energy efficiency measures are considered.

Low temperature solutions may be possible by solving challenges for a specific building type. Other technologies such as air-to-air heat pumps or exhaust 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. Detailed maps are provided in Appendix G and an overview is shown below in Figure 31.

Figure 31: Heat pump suitability and potential heat network areas



Low temperature solutions may be possible by solving particular challenges for a specific building type. Other technologies such as air-to-air heat pumps may most suitable 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.

8.2 Technology-Led Approach

8.2.1 Purpose

As an alternative to the spatial approach, the interventions in this section are grouped by tenure, who owns the property, as well as 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.

8.2.2 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 which are important to how measures could be implemented and who would make those decisions. In this section, therefore, 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 5 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. The second option, which is the main route forward for buildings across South Ayrshire, is installation of heat pumps either for a specific dwelling or a communal system serving a number of dwellings, such as a block of flats.

There are a range of technologies which could be considered for properties less suitable to heat networks or conventional air-to-water heat pump technologies. These include biomass, direct electric heating, air-to-air heat pumps, and high-temperature or 3-phase air-to-water heat pumps.

8.2.3 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 14 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 14 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 J.

Table 15: Intervention summary table

Intervention Reference	LHEES Consideration	Tenure	Energy Efficiency Measure	Displaced Fuel	SAC Action	Number of Properties	Notes
1	1) Off-gas grid buildings	All		Various	1.1 Survey properties with missing data. 1.2 Install low carbon heating in off-gas grid buildings.	8,935	
2	2) On-gas grid buildings	All		Gas	2.1 Survey properties with missing data. 2.2 Install low carbon heating in on-gas grid buildings.	57,949	
3	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Local Authority	Loft insulation	n/a	3.1 Survey properties with missing data. 3.2 Upgrade all insulation to 300 mm mineral wool (or equivalent)	1,933	There should be an economy of scale
4	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Local Authority	Wall insulation	n/a	4.1 Assess priority 4.2 Assess feasibility 4.3 Install cavity or cladding insulation	998	
5	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Local Authority	Glazing upgrade	n/a	3.1 Assess priority 3.2 Install double-glazing	213	
6	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Local Authority	Heat pump installation	Electricity	4.1 Survey properties for wet heating system installation requirements. 4.2 Install ASHP	871	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 for fuel poverty	Local Authority	Heat pump installation	Oil/ LPG	5.1 Install ASHP	325	
8	1) On gas grid 4) Poor building energy efficiency 5) Fuel Poverty Resulting from poor building energy efficiency	Local Authority	Heat pump installation	Gas	6.1 install ASHP 6.2 install electric cooker	7,266	May only improve fuel poverty if the gas meter and standing charge removed.

Intervention Reference	LHEES Consideration	Tenure	Energy Efficiency Measure	Displaced Fuel	SAC Action	Number of Properties	Notes
9	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Local Authority	Heat pump installation	Solid	7.1 Survey for requirement for wet heating system 7.2 Install ASHP	86	
10	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Local Authority	Heat pump installation	Biomass	8.1 Survey for requirement for wet heating system 8.2 Install ASHP	0	
11	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Loft insulation	n/a		703	
12	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Wall insulation	n/a		257	
13	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Glazing upgrade	n/a		40	
14	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Heat pump	Electricity		339	
15	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Heat pump	Oil/LPG		42	
16	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Heat pump	Gas		1,930	May only improve fuel poverty if the gas meter and standing charge removed.
17	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Housing Association	Heat pump	Solid		4	Low volume = Low impact
18	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Loft insulation	n/a		16,880	

Intervention Reference	LHEES Consideration	Tenure	Energy Efficiency Measure	Displaced Fuel	SAC Action	Number of Properties	Notes
19	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Wall insulation	n/a		17,232	
20	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Glazing upgrade	n/a		2,254	
21	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Heat pump	Electricity		2,686	
22	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Heat pump	Oil/LPG		3,433	
23	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Heat pump	Gas		33,071	May only improve fuel poverty if the gas meter and standing charge removed.
24	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Heat pump	Solid		290	
25	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Owner occupied	Heat pump	Biomass		136	Low priority wrt. carbon
26	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Loft insulation	n/a		2,711	
27	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Wall insulation	n/a		3,599	
28	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Glazing upgrade	n/a		653	

Intervention Reference	LHEES Consideration	Tenure	Energy Efficiency Measure	Displaced Fuel	SAC Action	Number of Properties	Notes
29	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Heat pump	Electricity		893	
30	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Heat pump	Oil/LPG		730	
31	2) On-gas grid buildings 4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Heat pump	Gas		4,920	May only improve fuel poverty if the gas meter and standing charge removed.
32	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Heat pump	Solid		55	
33	4) Poor building energy efficiency 5) Poor building energy efficiency as a driver for fuel poverty	Privately rented	Heat pump	Biomass		62	
34	6) Mixed-tenure, mixed-use and historic buildings	Mixed	All	-	32.1 Map which of the above interventions apply to mixed-tenure		
35	6) Mixed-tenure, mixed-use and historic buildings	Historic	All	-	33.1 Map which of the above interventions apply to mixed-tenure		

8.3 Non-domestic properties

8.3.1 Overview of properties to decarbonise

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

- The majority of properties are heated by either electricity or gas (Figure 4)- and electricity will eventually decarbonise itself
- The majority of the smallest properties are heated electrically (Figure 5) – 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 6)

Strategically, then, the focus should be on gas-heated properties greater than 100m^2. Common building types in this category include Retail and Finance, Offices and Workshops, and Non-residential Institutions (Figure 32). By estimated heat demand, these three sectors are still top of the list, alongside hotels (Figure 33) so these should be the target of decarbonisation efforts.

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

Figure 32: Larger, gas-heated non-domestic properties by use type

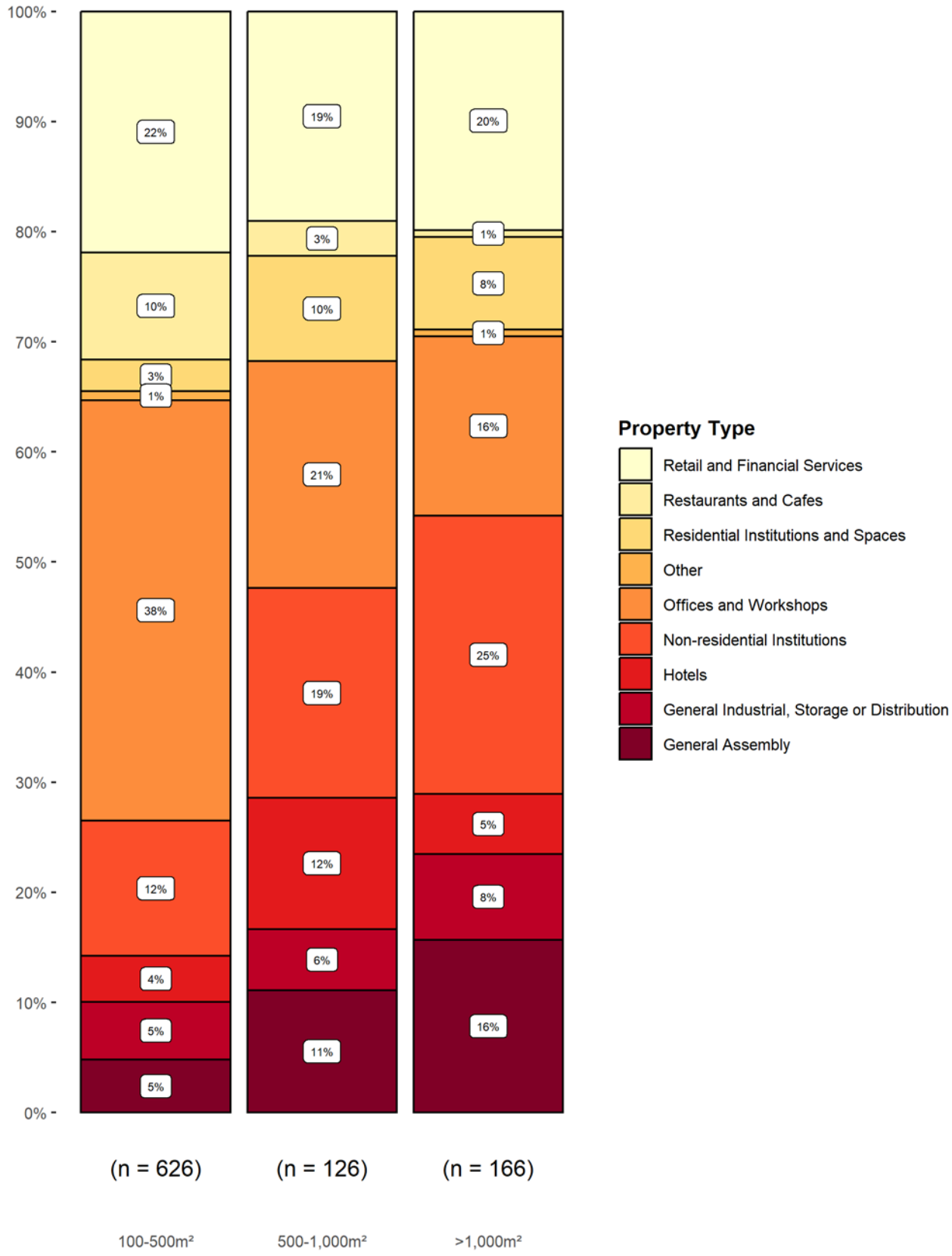


Figure 33: Space heating demand in larger, non-domestic, gas-heated buildings by type

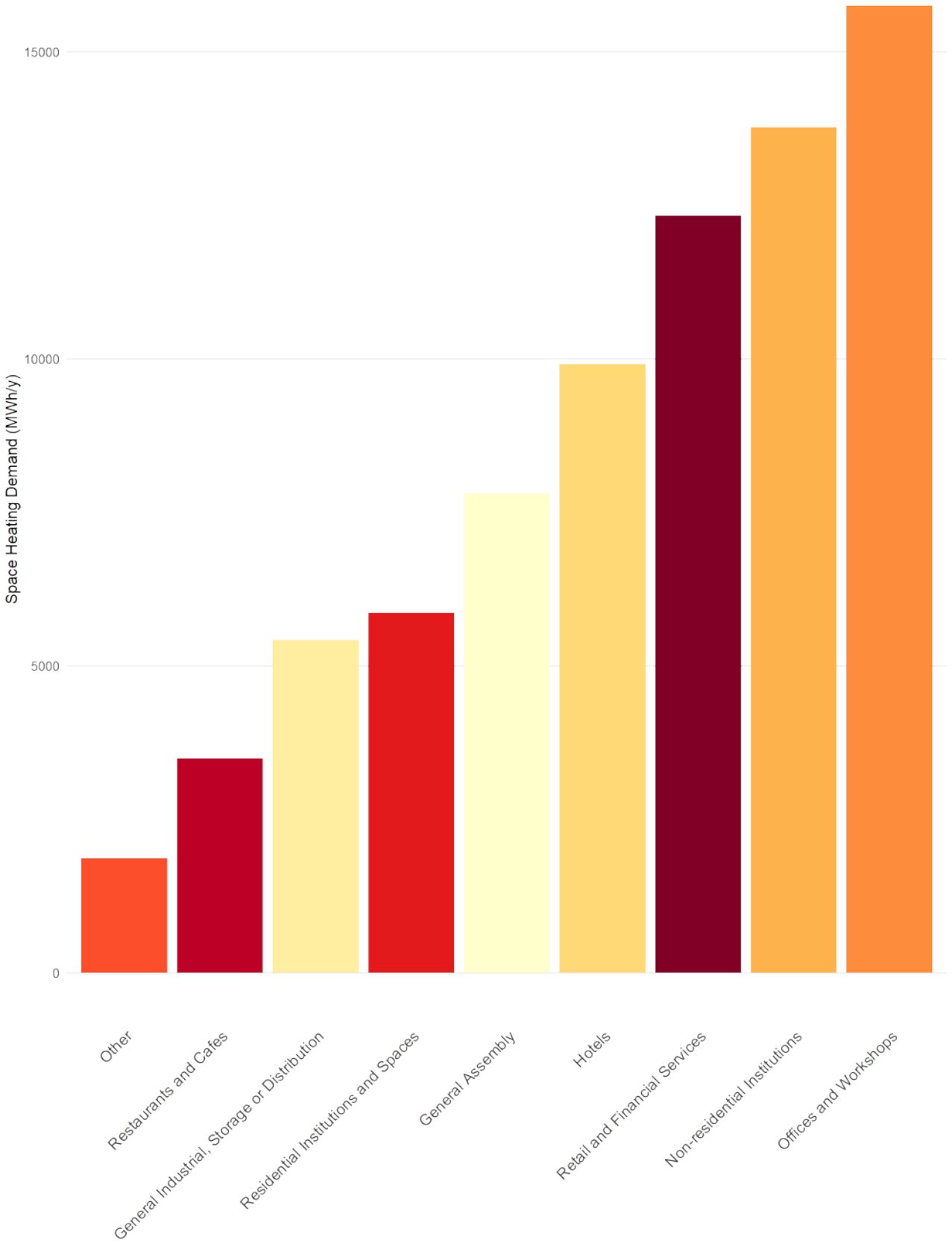
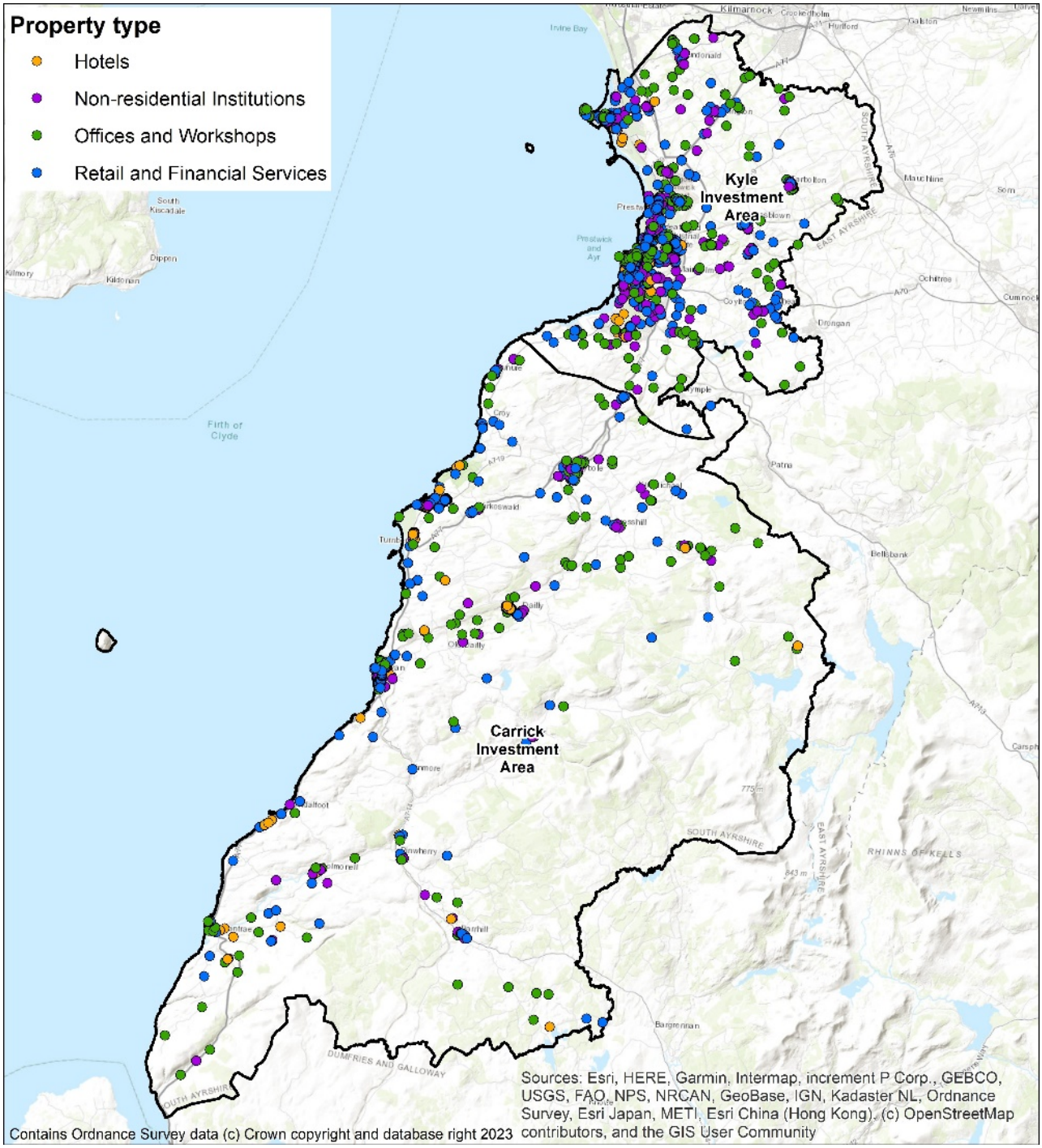


Figure 34: Map with top non-domestic, gas-heated energy consuming types



8.3.2 Non-domestic buildings energy efficiency

Using the publicly-available EPC records, around 2,000 EPCs are lodged for South Ayrshire. By far the largest proportion of these have a rating of G (Table 15). This must be viewed as a target to improve energy efficiency overall in South Ayrshire.

Table 16: Non-domestic EPCs in South Ayrshire

EPC Rating	Count	Percentage
A	27	1 %
B	87	4 %
C	233	12 %
D	315	16 %
E	354	18 %
F	255	13 %
G	693	35 %

8.3.3 South Ayrshire Council Portfolio

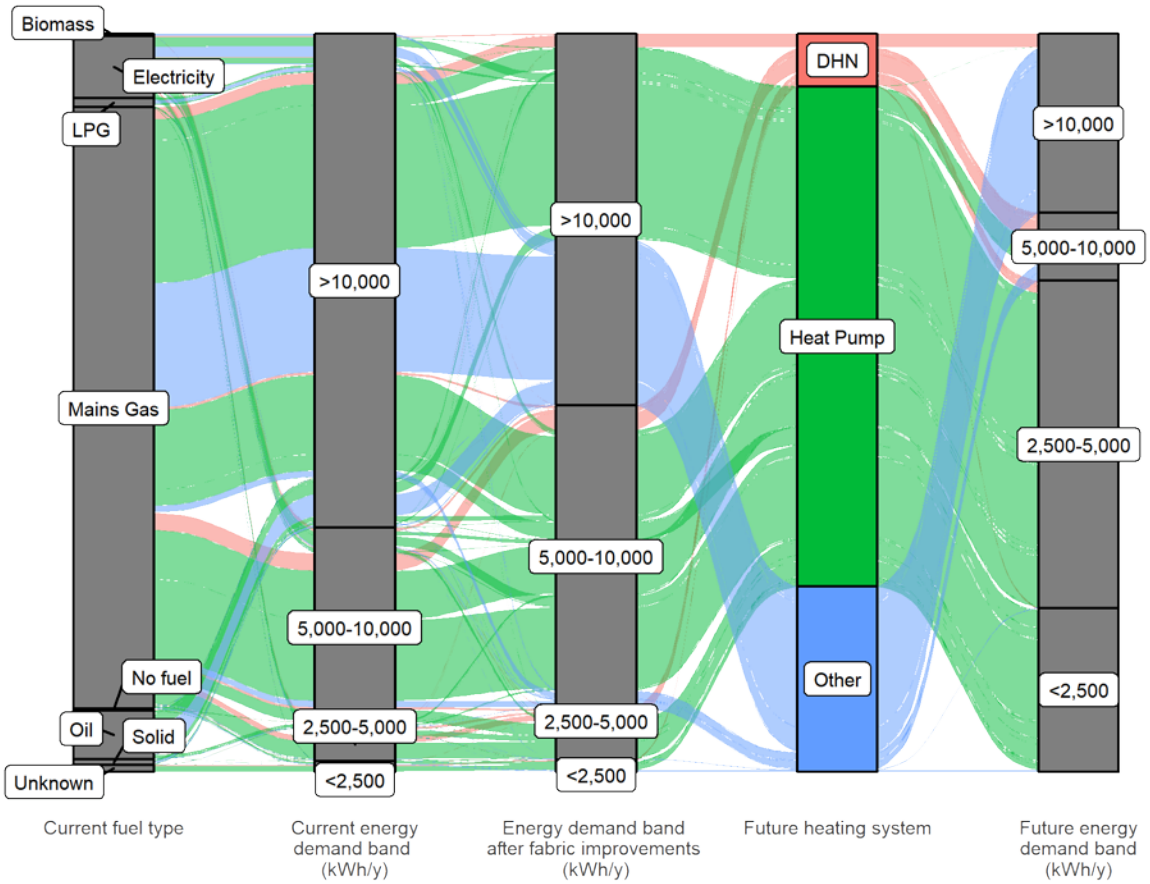
South Ayrshire Council own 10 buildings with oil as a heat source which consume over 900 MWh/year of heat. Over 100 more council-owned buildings consume over 36,000 MWh of heat from gas. These are significant amounts of heat to be decarbonised and a first step to achieving this will be to prepare energy efficiency and decarbonisation plans for each building.

9. Pathways for all of South Ayrshire

9.1 Decarbonisation of Heat Pathway

The journey to the decarbonisation of each domestic property in South Ayrshire is shown in Figure 35. The first column shows the proportions of properties which begin with each fuel source. The second groups the properties by their total heat demand, in kWh/year. The third column assumes reasonable energy efficiency measures have been applied and groups the properties by their improved heat demand. The suitability of each property for each of the low carbon heat measures is then shown. This assumes all listed heat network zones are developed but doesn't consider further expansion. It can be seen clearly that heat pumps are the most suitable technology for the majority of homes. Finally, the column on the right shows the energy imported to the property to meet heat demand. For heat networks, this is simply heat purchased. For electric heating and heat pumps it is units of electricity.

Figure 35: Decarbonisation and energy efficiency pathway



The shifting of individual properties down from one energy demand band to the next is visualised in Figure 36, where the comparison of heat pumps to direct electric heating shows how effective heat pumps will be in reducing the risk of fuel poverty.

At a local authority level, Figure 37 shows how interventions in and shifting demand of individual properties could reduce the total heat energy consumption in South Ayrshire. It is also evident in Figure 36 and Figure 37 that heat pumps on their own make a bigger difference to energy demand than fabric improvements but fabric improvements have a role in both demand reduction and in making homes suitable for heat pumps (8.1.8).

Figure 36: Shifting energy demand by fabric improvement and heat pump installation

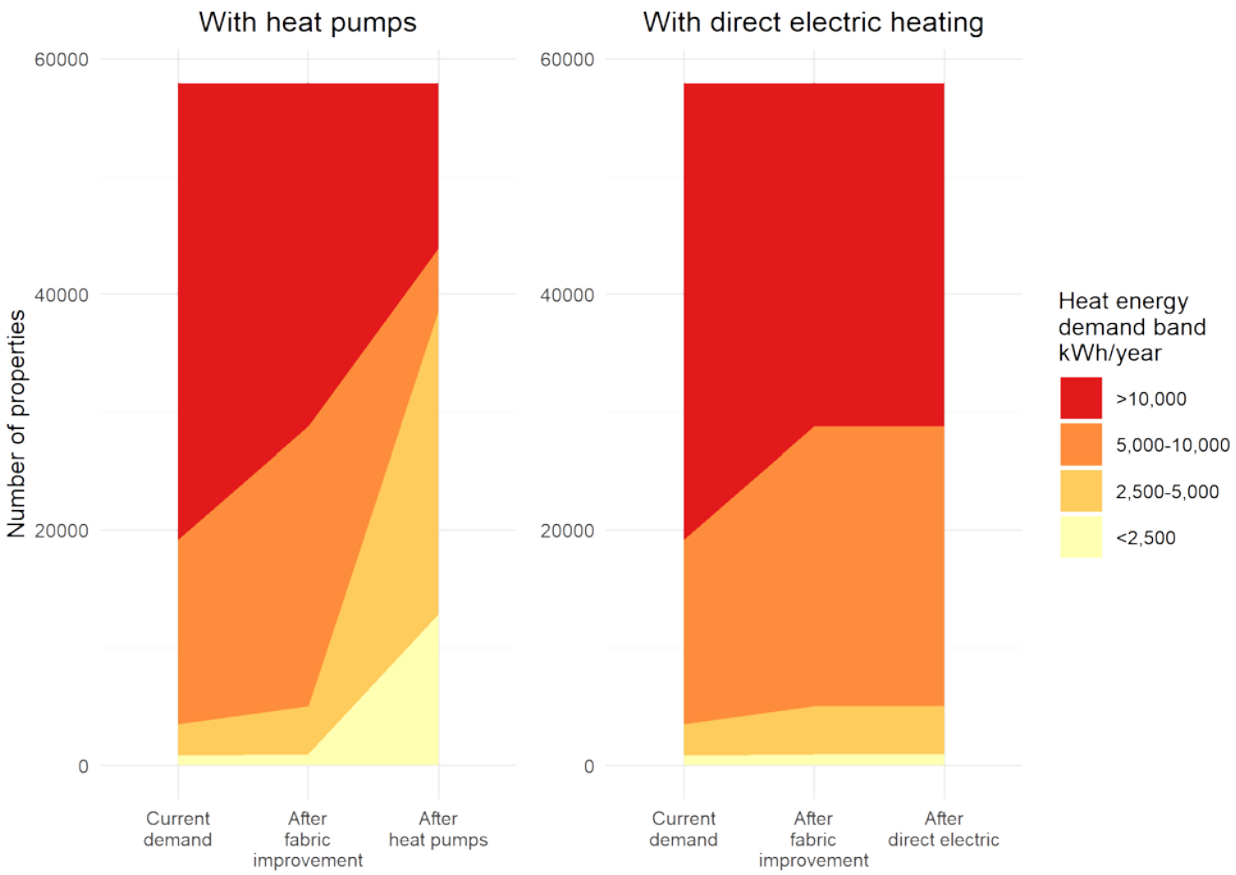
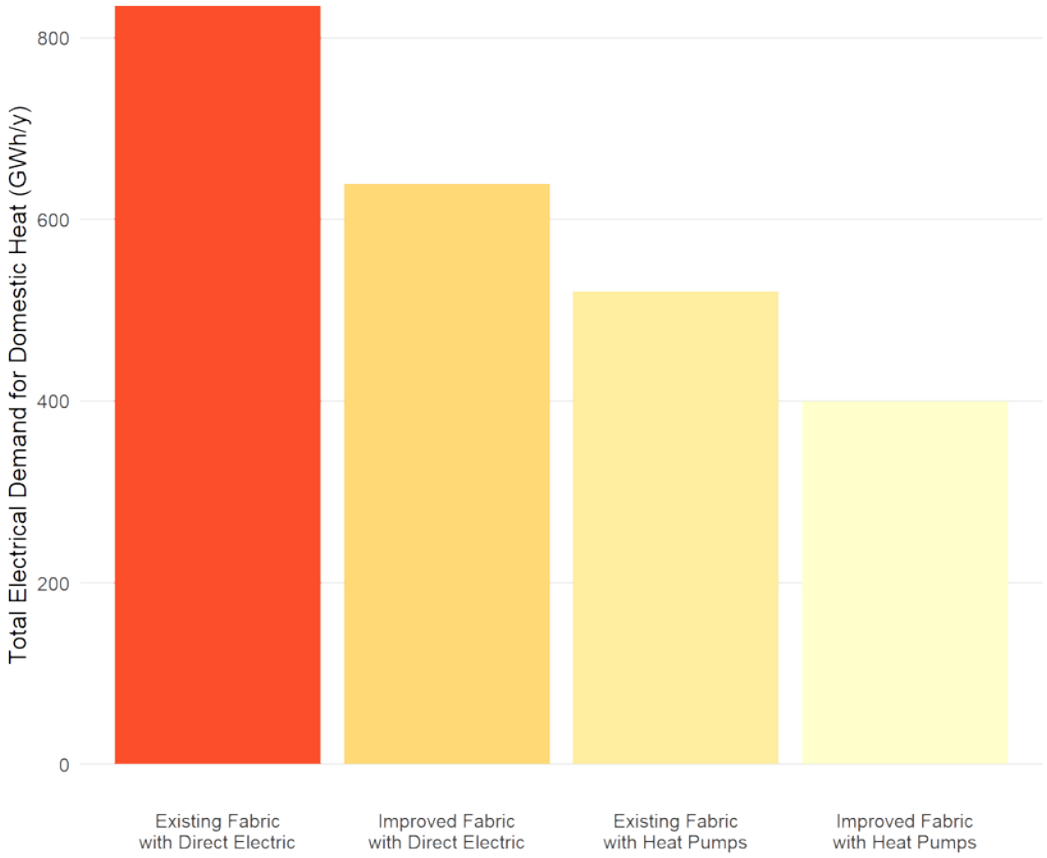


Figure 37: Total electricity demand reduction after energy efficiency measures and/ or heating system upgrade



9.2 Fuel Poverty

Reducing the heat demand of the buildings through installing energy efficiency measures is clearly important as it can both reduce the amount of heat to be decarbonised and the cost of heating. This section examines the properties in the areas with the lowest SIMD score 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 and, consequently, on their risk of fuel poverty.

Figure 38: Effect of actions in all properties in SIMD 1 areas – energy efficiency and heat pumps

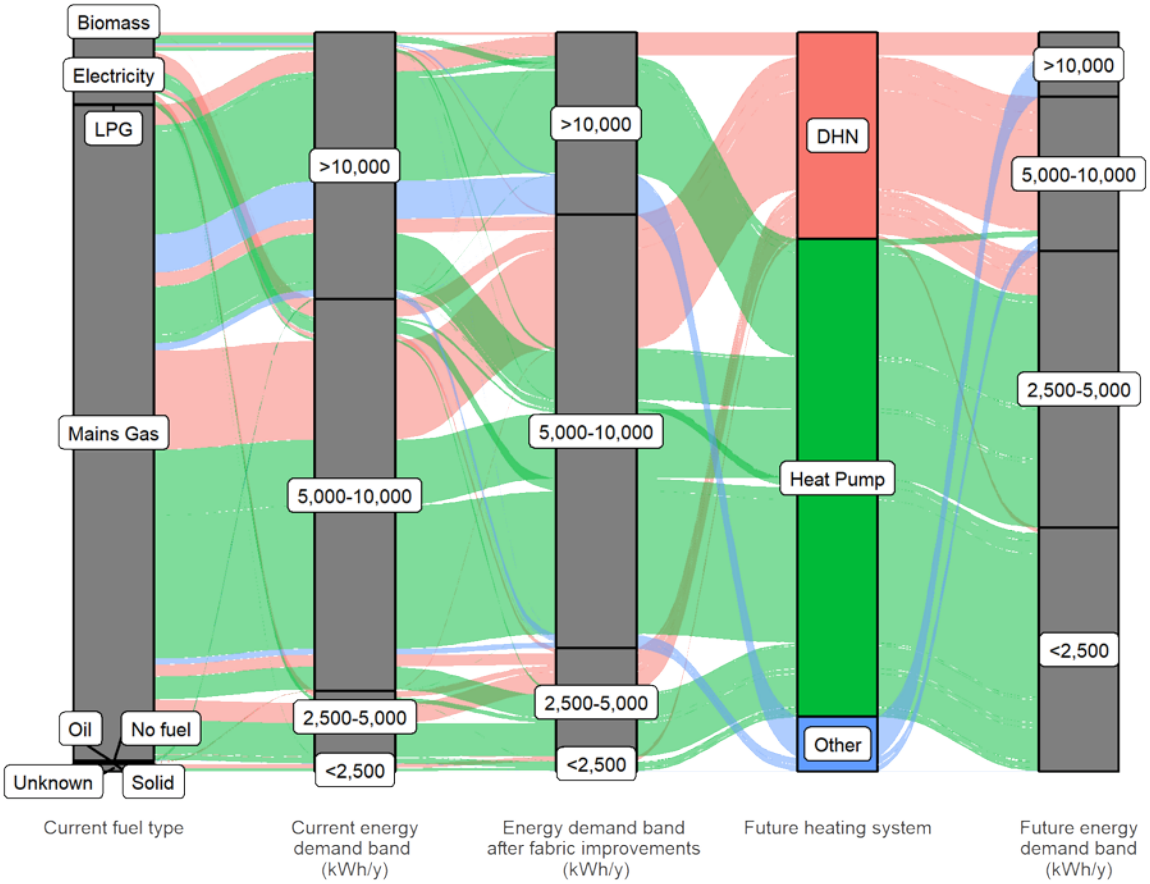


Figure 38 shows the decarbonisation journeys for all properties in areas which have a SIMD score of 1, the most deprived areas. This shows the main heating fuel they use at present, the proportion of properties in each energy demand band (kWh/year) and then the numbers in each band after energy efficiency measures and low carbon heating technologies are installed.

Installing energy efficiency measures significantly reduces the number of properties with heat demands of over 10,000 kWh/year. Utilising heat pumps reduces this further to a very small proportion but also results in one quarter of homes being in the lowest band, with an annual demand of <2,500 kWh/y. If direct electric heating, rather than heat pumps, were used as the low-carbon choice, then the number of homes in SIMD 1 areas with such low energy demand would be negligible (the third column in Figure 38). For the purposes of this Strategy, heat pumps are considered the preferred solution to minimise fuel poverty, in properties where low-cost district heating is not an option.

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.

Unheated homes

The Scottish Housing Condition Survey 2019[18] 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 both reduces how much it would cost them to heat their home, should they be able to do so, and limits 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

[18] 5 Energy Perceptions - Scottish house condition survey: 2019 key findings - gov.scot (www.gov.scot)

the decision as to whether to focus capital spend on additional insulation measures or lower cost heating systems is therefore complex.

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.

9.3 Heat Networks

Heat networks have a role to play in the future of heat in South 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 phrase “heat networks” refers to district heating schemes where multiple buildings are connected by underground pipework.

The maps in Appendix F highlight a number of areas around Ayr which have potential to be developed into heat networks.

The suitability of the buildings for connection to heat networks is not known. Further work such as Building Assessment Reports (BARs)[19] and engagement with stakeholders is important to inform future decisions on these sites.

Even in the zones where heat networks are an option, there are differences between the domestic properties which are most likely to be suitable, such as blocks of flats, and properties which are less likely to be suitable, such as detached houses[20].

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 date.

9.4 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, has to lead to a cost of heat that is comparable to natural gas boilers and 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 equally many good experiences, it is essential to understand what is required for heat pumps to meet the needs of residents. 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.

South 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; 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. South Ayrshire Council will work consider what actions which the Council could take to encourage a local supply chain of low carbon heating installers.

While it is for each property owner to make their own decision on the heating system they prefer, there is a role for the 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 including signposting to national advice schemes operated by Scottish Government or UK Government.

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

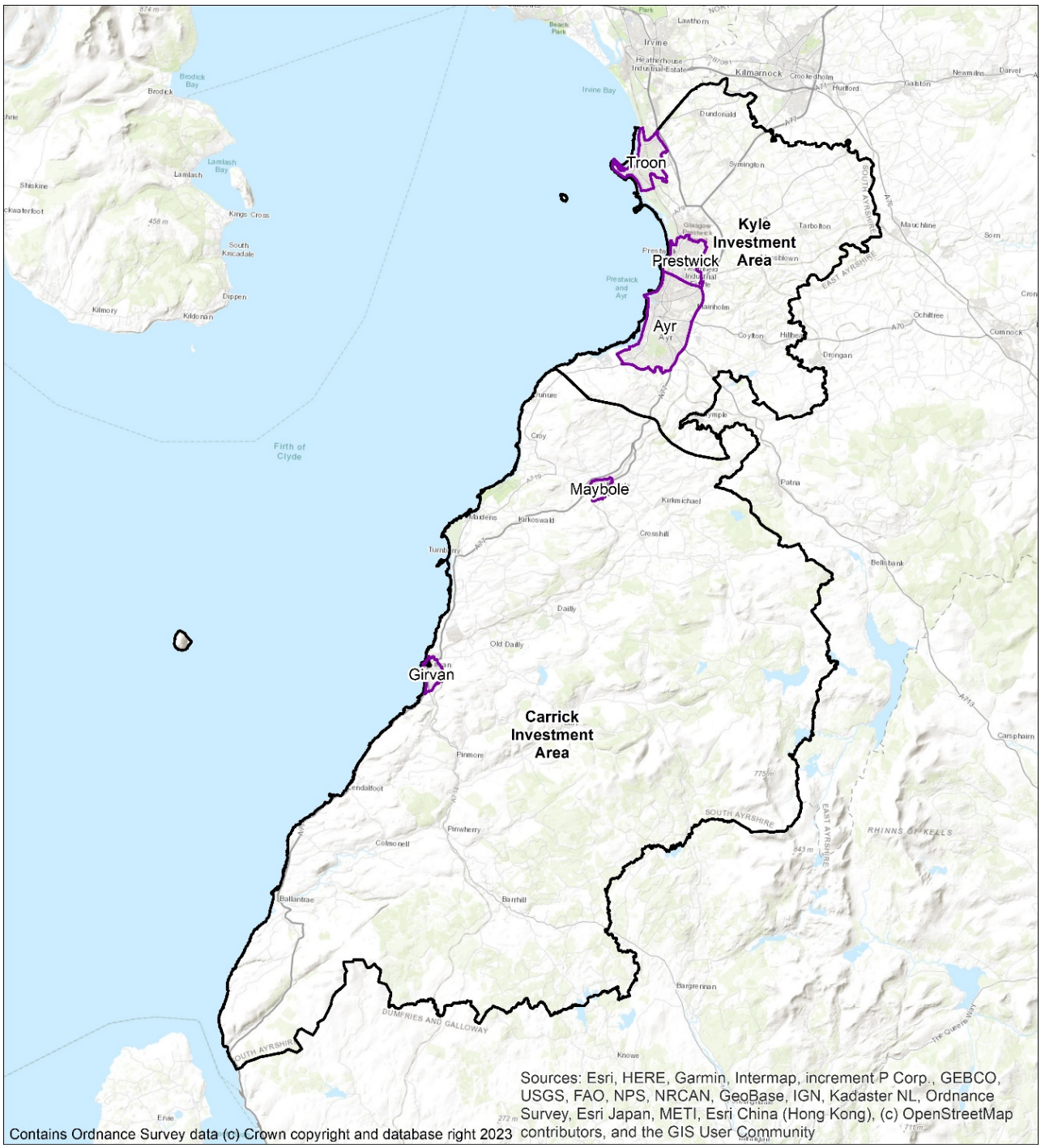
[20] Detached houses may be considered to be less suitable to connect due to the individual sections of pipework that are required to connect the buildings to the network, on a linear heat density approach, the longer the connecting pipework, the “harder” the pipework has to work to satisfy loads.

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

10. Pathways for Strategic Zones

10.1 Strategic Zones

Figure 39: Strategic zones



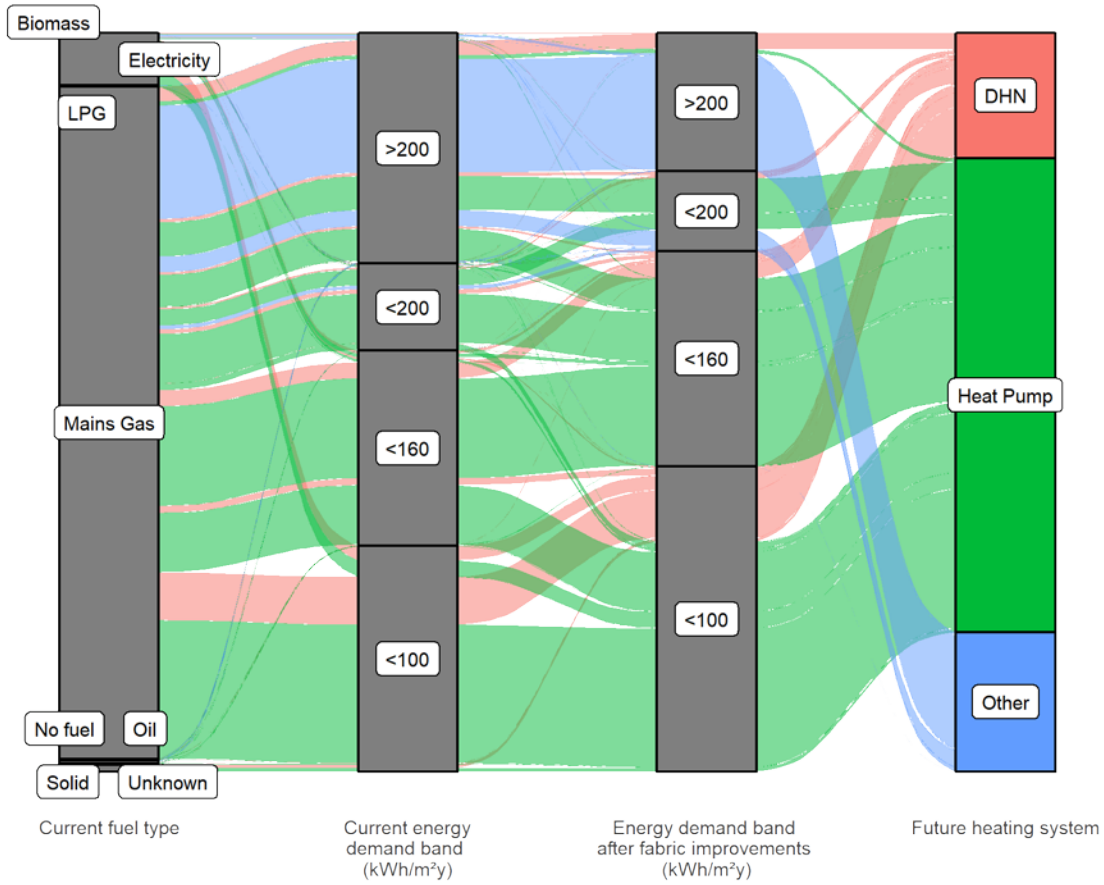
10.2 Ayr

Figure 40 shows all domestic properties within the Ayr area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

The majority of properties in the Ayr area are suitable for heat pumps but the impact of energy efficiency measures is modest, reflecting the EPC rating spread (Figure 9).

Ayr also has potential for heat network zones. The pathway shows the proportion of domestic properties which are within the potential heat network area.

Figure 40: Decarbonisation pathway for domestic properties in Ayr

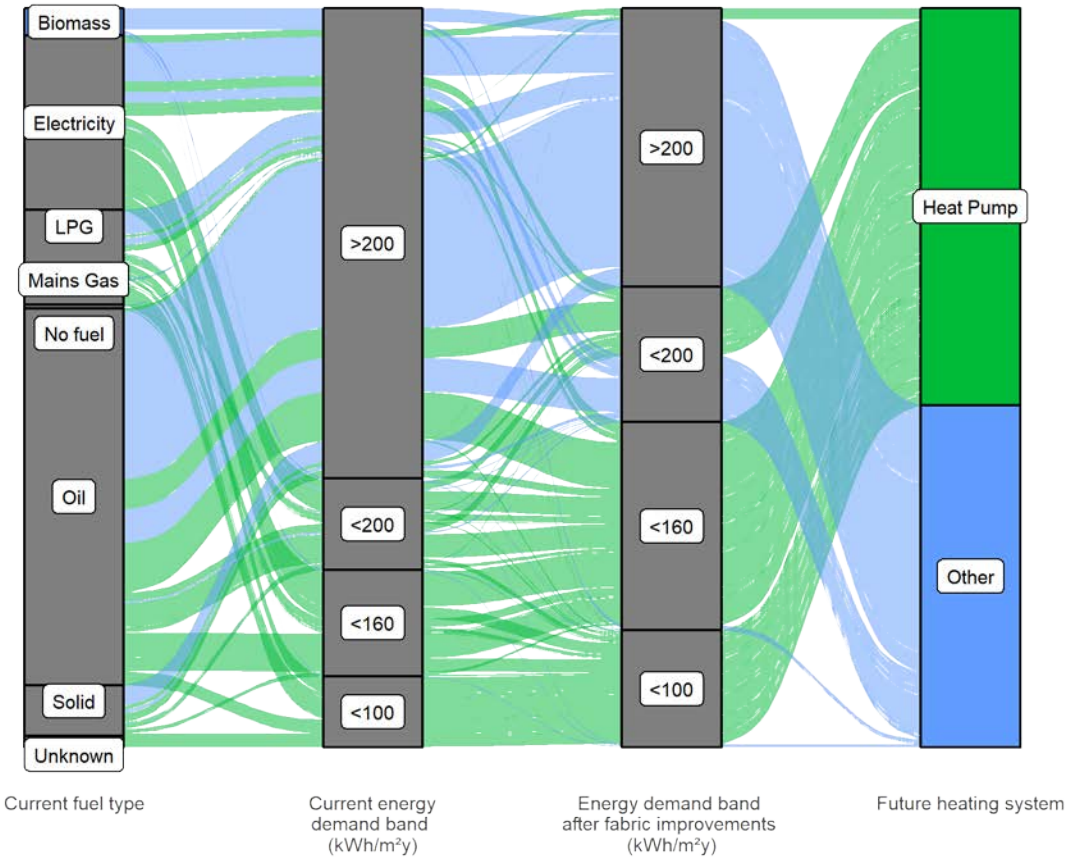


10.3 Carrick

Figure 41Figure 40 shows all domestic properties within the Carrick area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

Carrick is a rural area with very few properties on mains gas and a significant number using oil. Energy saving measures make a big impact, reflecting the poor EPC scores (Figure 9). Around half of the properties in the Carrick area are suitable for simple heat pump installations but the other half may need other solutions (see 0). Carrick has a higher proportion than other areas of detached homes built before 1919 and theses are to factors which contribute to poor energy efficiency.

Figure 41: Heat decarbonisation pathway for Carrick



There are a significant number of properties which have high heat demand and are hard to treat. The data shows that there are 90 properties in this area which are considered by this Strategy to be hard to treat with heat pumps, but which already have heat pumps.

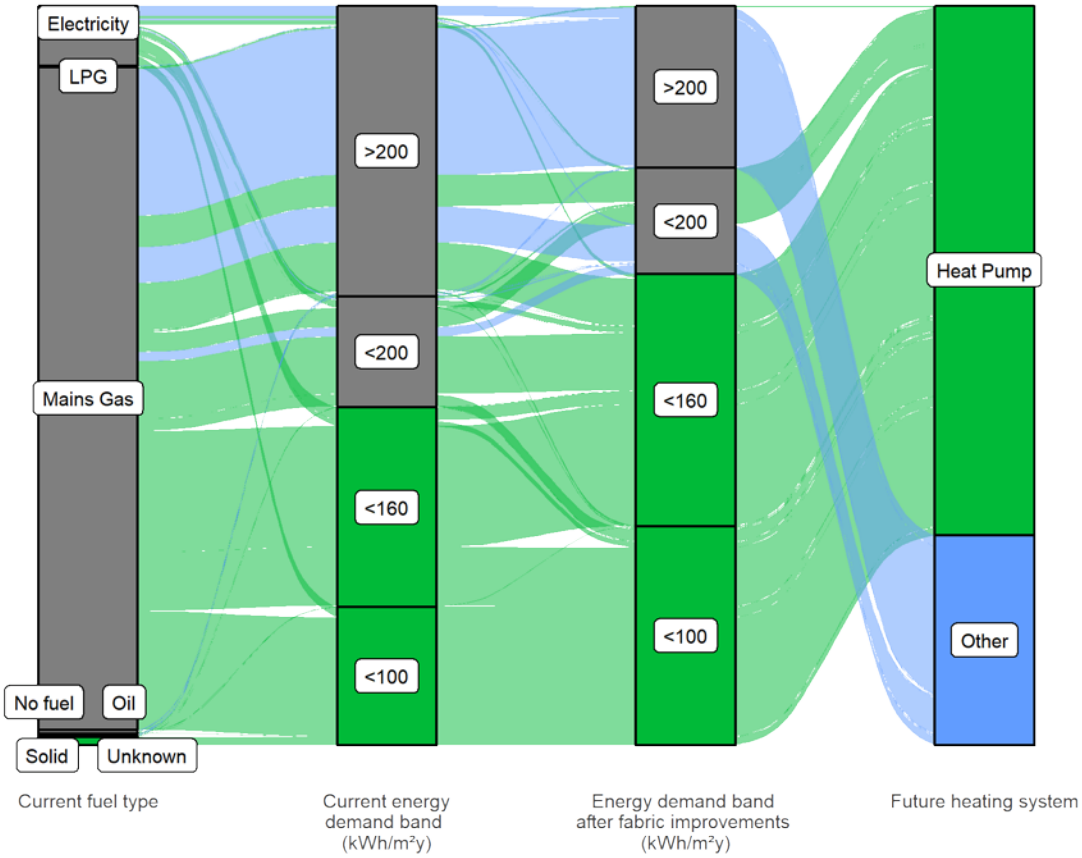
This suggests that there are installers and property owners who have solved the problems associated with installing heat pumps in these hard to treat properties. There is an opportunity to learn from these installations, share good practice and form case studies which show potential solutions.

10.4 Girvan

Figure 42 shows all domestic properties within the Girvan area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

The majority of homes in the Girvan area are suitable for simple heat pump installations.

Figure 42: Heat decarbonisation pathway for Girvan

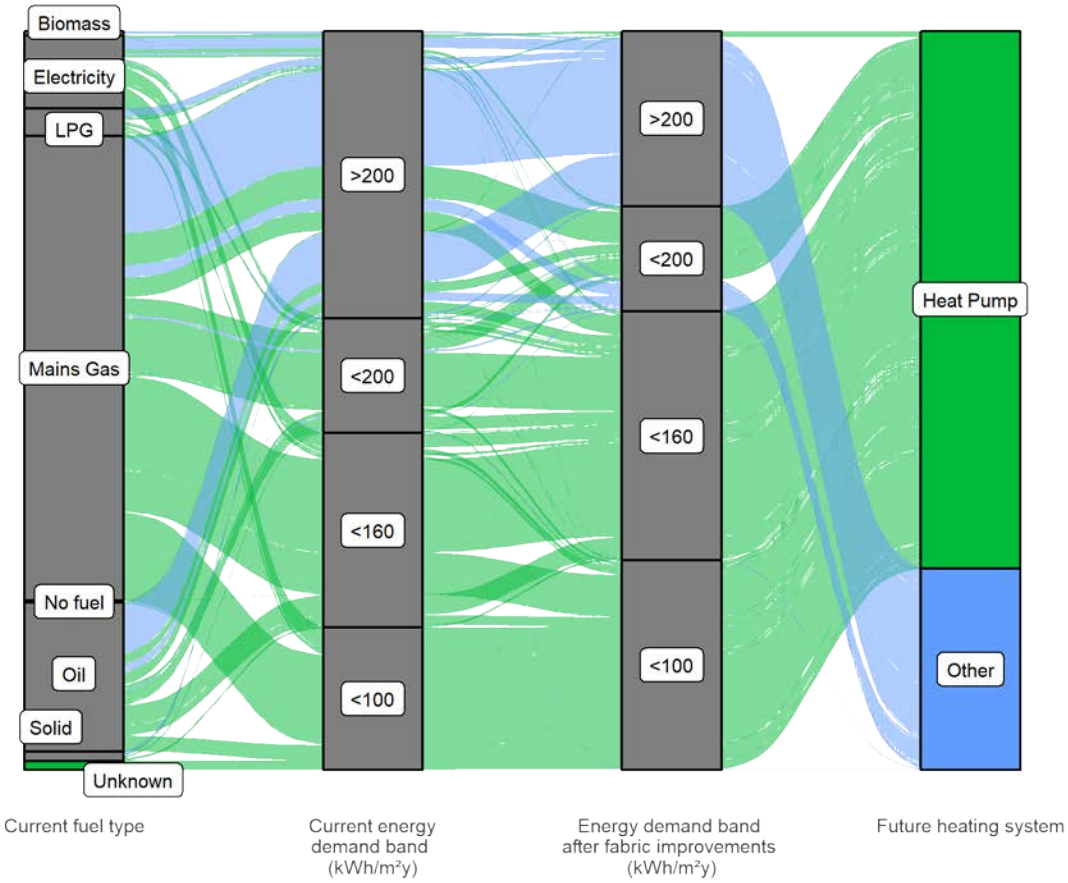


10.5 Kyle

Figure 43shows all domestic properties within the Kyle area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

The majority of homes in the Kyle area are suitable for simple heat pump installations.

Figure 43: Heat decarbonisation pathway for Kyle

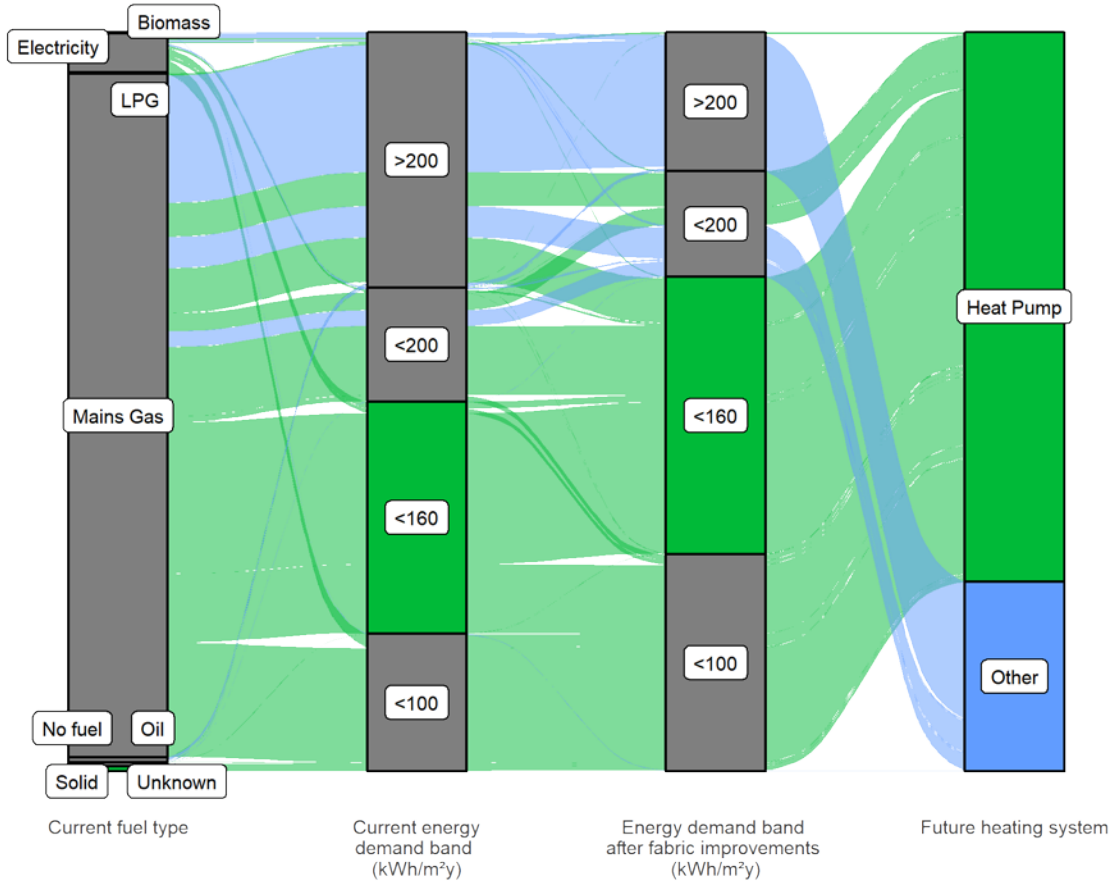


10.6 Maybole

Figure 44 shows all domestic properties within the Maybole area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

The majority of homes in the Maybole area are suitable for simple heat pump installations.

Figure 44: Heat decarbonisation pathway for Maybole

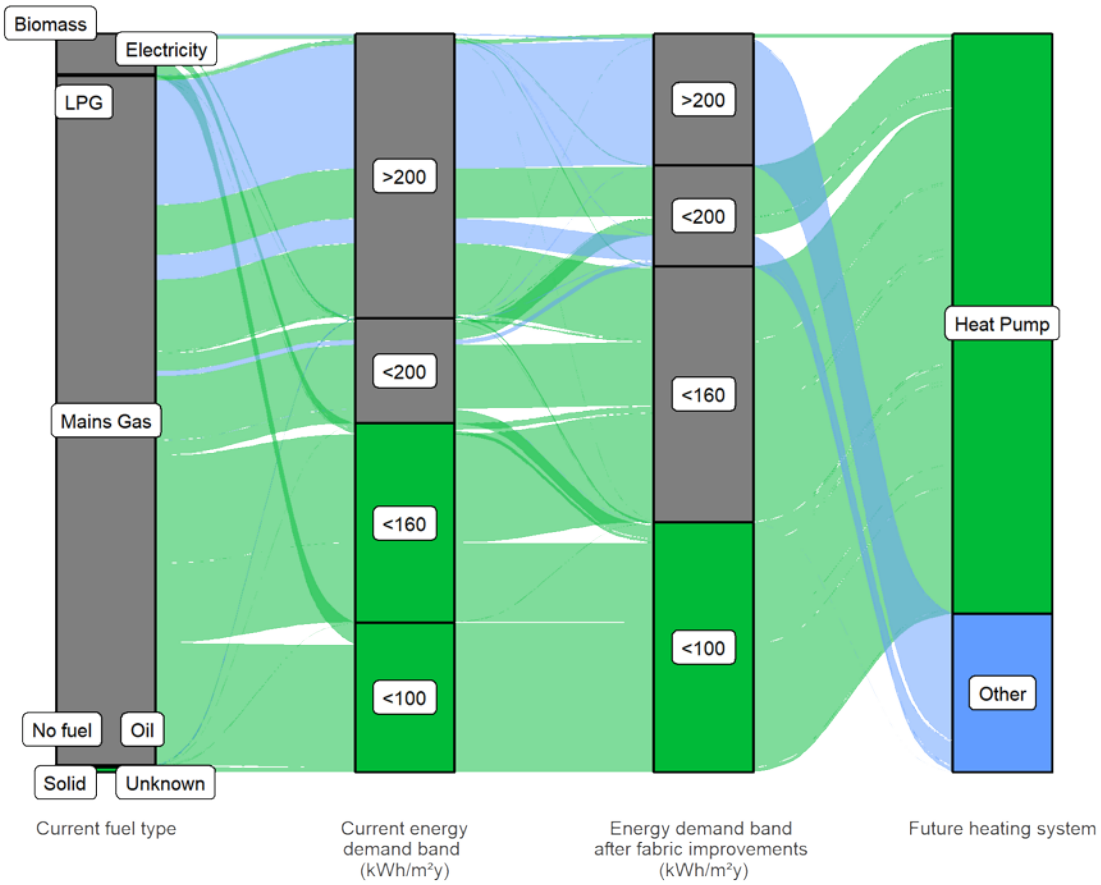


10.7 Prestwick

Figure 45 shows all domestic properties within the Prestwick area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

The majority of homes in the Prestwick area are suitable for simple heat pump installations.

Figure 45: Heat decarbonisation pathway for Prestwick

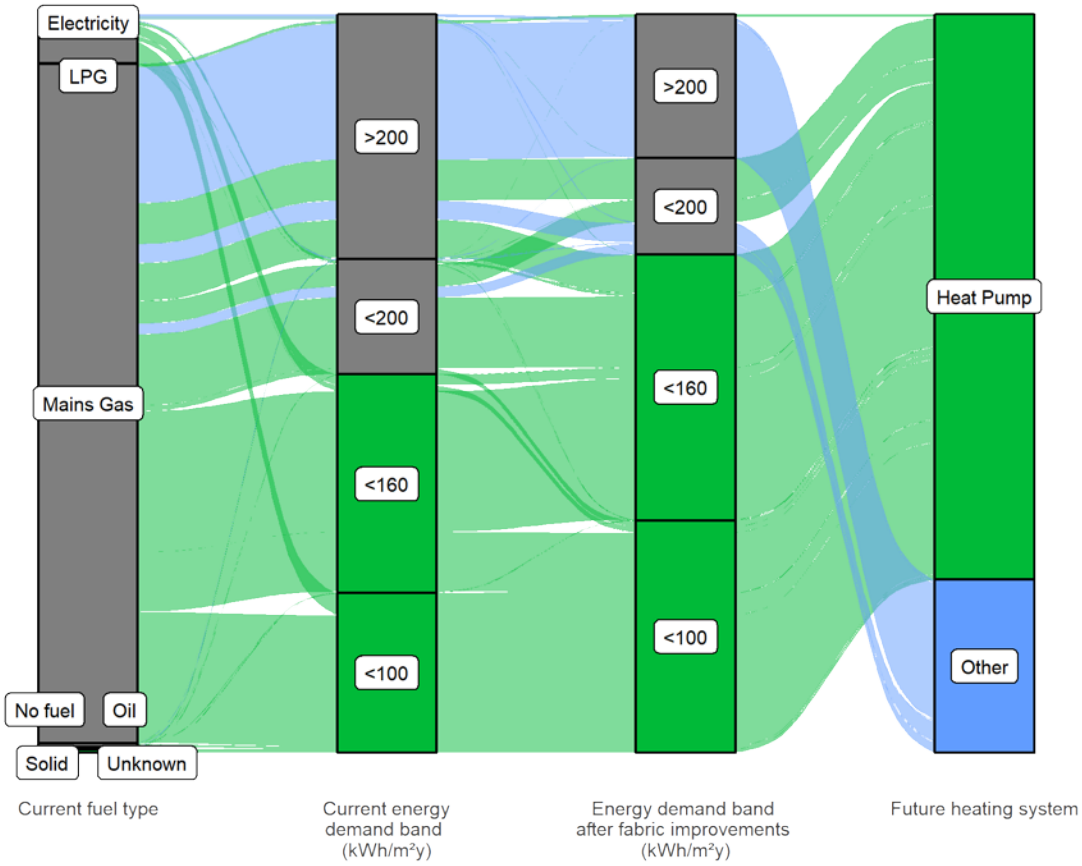


10.8 Troon

Figure 46 shows all domestic properties within the Troon area and, from the left, the heating fuel each uses today, the energy demand of the property per unit of floor area, the energy demand after the application of reasonable energy efficiency measures and finally the most suitable heating technology for each property at present.

The majority of homes in the Troon area are suitable for simple heat pump installations.

Figure 46: Heat decarbonisation pathway for Troon



11. Conclusions

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

The strategic approach will be:

1) Insulation of buildings where practical.
2) Support development of district heating networks where they can provide reliable low carbon heat at a reasonable cost.
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

Appendix A Index of Tables and Figures

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Appendix B Legislation Relating to LHEES

Table 17: Summary of policy and legislation

UK-Wide
The Climate Change Act 2008 (2050 Target Amendment) Order 2019: Net Zero GHG Emissions by 2050
National – General
Heat in Buildings Strategy (2021) Sets out a pathway to zero emissions buildings by 2045 and includes the New Renewable Heat Target for 2030
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 networked 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 % 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; and • 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 lead partners on Priority Area 1: Supporting a green labour market recovery from Covid-19, and Priority Area 5: Ensuring fairness and inclusion in the skills system as part of a just transition to net zero.
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"

National – Public Sector Specific
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 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).

Appendix C Analysis of Core Indicators by Intermediate Zone

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

Domestic Energy Efficiency

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

Table 17 ranks the top 12 intermediate zones on overall weighted score for energy efficiency. The maximum possible score (i.e. if every home in the zone had no loft or wall insulation and single glazing) is 100 so these scores are not high. It is notable that the spread across the zones is quite wide, with four standing out (Figure 47), suggesting that there may be grounds to prioritise interventions in one geographic area over another.

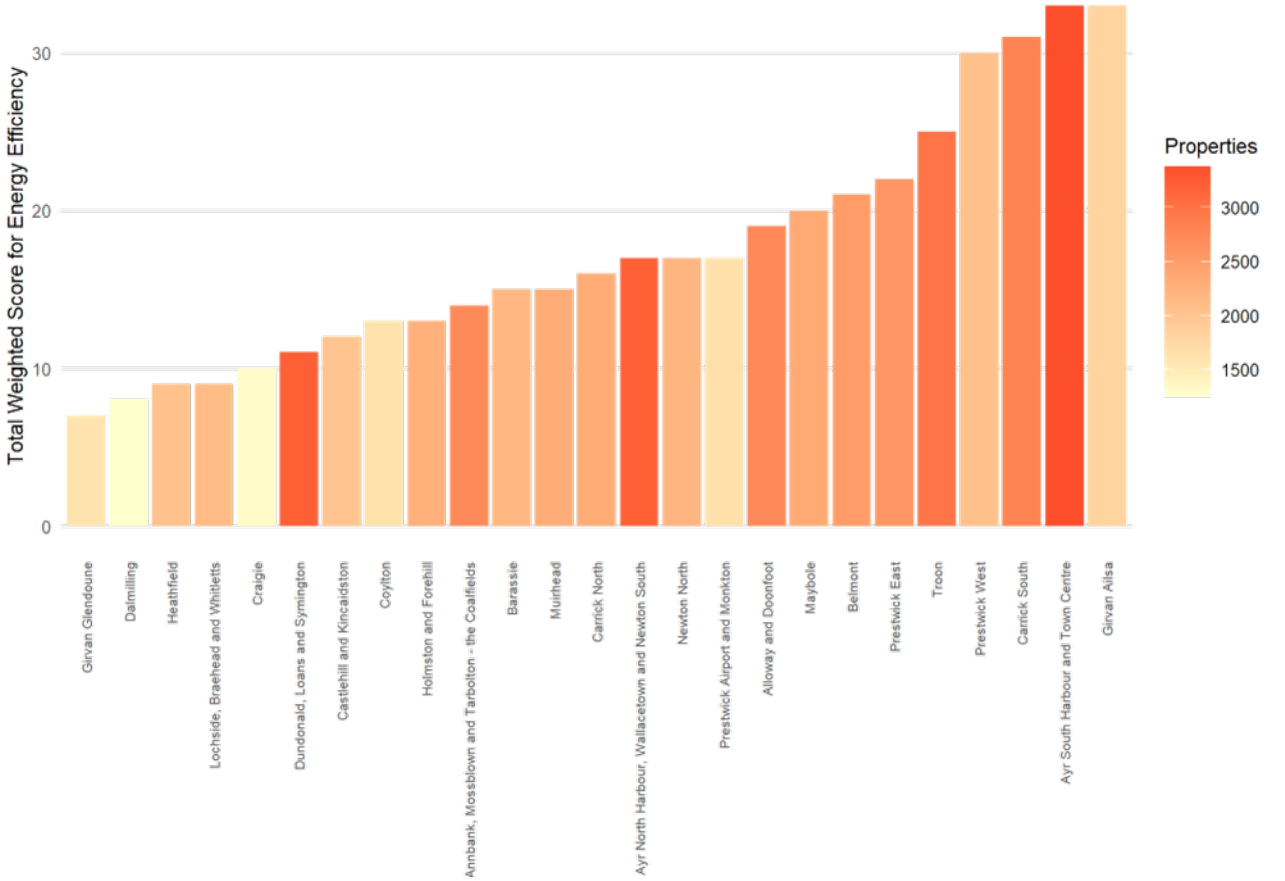
Wall insulation appears to be the most obvious target for improvement with the number of houses requiring an intervention ranging from 35 to 66 % in these 12 zones (compare to 2 to 22 % for loft insulation).

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

Rank	Zones with highest total weighted score	Total weighted score	Number of potential interventions identified	Number of properties in zone
1	Ayr South Harbour and Town Centre	33	3,327	3,376
2	Girvan Ailsa	33	1,776	1,811
3	Carrick South	31	2,591	2,813
4	Prestwick West	30	1,871	2,060
5	Troon	25	2,271	2,983
6	Prestwick East	22	1,734	2,594
7	Belmont	21	1,613	2,529
8	Maybole	20	1,387	2,355
9	Alloway and Doonfoot	19	1,575	2,749
10	Newton North	17	1,131	2,208
11	Ayr North Harbour, Wallacetown and Newton South	17	1,630	3,211
12	Prestwick Airport and Monkton	17	836	1,658

There are a total of 25 zones.

Figure 47: Weighted Energy Efficiency Scores



Domestic Fuel Poverty

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

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

The ranking of the top 12 zones where energy efficiency is a driver for fuel poverty is shown in Table 18. The default weightings are used and, if specific interventions to tackle fuel poverty are to be prioritised during later stages of LHEES, then it may be appropriate to re-calculate these weighted scores based on the type of intervention planned. The variance between zones is less than for the Total Energy Efficiency Score with only the top three (the same top three) standing out (Figure 48).

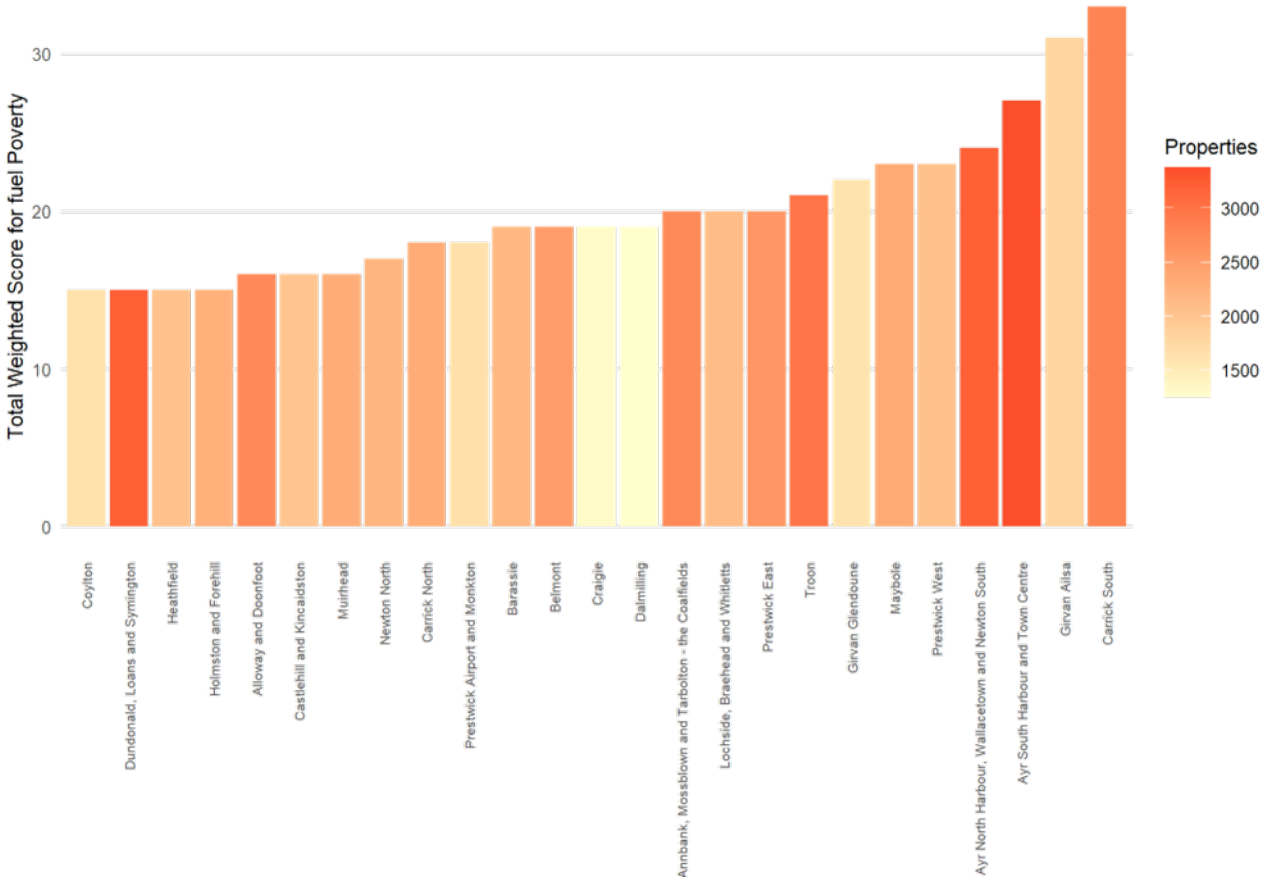
Table 19: Domestic fuel poverty resulting from poor energy efficiency - highest ranked zones (default weightings)

	Zones with highest total weighted score	Total weighted score	Number of properties in zone
1	Carrick South	33	2,813
2	Girvan Ailsa	31	1,811
3	Ayr South Harbour and Town Centre	27	3,376

	Zones with highest total weighted score	Total weighted score	Number of properties in zone
4	Ayr North Harbour, Wallacetown and Newton South	24	3,211
5	Maybole	23	2,355
6	Prestwick West	23	2,060
7	Girvan Glendoune	22	1,618
8	Troon	21	2,983
9	Lochside, Braehead and Whitletts	20	2,121
10	Annbank, Mossblown and Tarbolton - the Coalfields	20	2,738
11	Prestwick East	20	2,594
12	Dalmilling	19	1,249

There are a total of 25 zones. A further 3 zones have a score of 19.

Figure 48: Weighted scores for fuel poverty resulting from poor energy efficiency



Domestic Buildings and the Gas Grid

Being on or off the existing gas grid are considerations within the LHEES process because this influences the likely future supply and decarbonisation of heat. On-grid buildings are likely to be currently using a fuel which is not getting less carbon intensive but are likely to have wet heating systems, suitable for heat network connections or heat pumps. Off-grid buildings are likely to be using a fuel which is getting closer to carbon neutral but not likely to have a wet system suitable for an electricity-saving upgrade to heat pumps. Of the off-grid properties, more use direct electrical heating than boilers. While these properties do not have water based heating systems, they are more likely to both reduce their energy consumption and running cost by switching

to a heat pump than properties using lower cost energy sources. As such heat pumps in these properties could contribute to fuel poverty reduction but not necessarily towards net zero targets.

Table 19 details the heating systems associated with domestic properties on and off the gas grid. Almost all the on grid homes have boilers and, physical situation aside, are likely to be able to be connected to heat networks or heat pumps. However, given the energy efficiency status of the housing stock (Figure 2 and Table 17) and the age (Figure 2) it is likely that interventions to reduce heat losses and adjust heating systems to operate at lower temperatures will be required to allow heat pump installations in places where there are unlikely to be heat networks.

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

Heating System	On grid		Off grid	
	Count	Percentage	Count	Percentage
Communal	77	<1 %	79	1 %
Heat pump	440	<1 %	308	4 %
Boiler	46,464	96 %	5,443	62 %
Room heater	430	<1 %	685	8 %
Storage heater	805	2%	2,076	24 %
Other or none	268	<1 %	232	3 %

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

Appendix D Analysis of Core Indicators by Data Zone

Domestic Energy Efficiency

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

Table 20 lists all the zones and is the companion to Figure 19.

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

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
Ayr South Harbour and Town Centre - 02	20%	35%	74%	42.9
Ayr South Harbour and Town Centre - 06	20%	30%	77%	42.0
Ayr South Harbour and Town Centre - 05	21%	25%	74%	39.7
Girvan Ailsa - 02	35%	7%	76%	39.0
Ayr South Harbour and Town Centre - 03	13%	26%	75%	37.8
Prestwick West - 03	29%	5%	76%	36.6
Belmont - 04	16%	12%	83%	36.6
Carrick South - 02	25%	12%	73%	36.4
Prestwick West - 02	24%	10%	75%	36.3
Prestwick East - 02	28%	7%	74%	35.9
Girvan Ailsa - 03	24%	9%	74%	35.7
Girvan Ailsa - 05	24%	8%	68%	33.4
Mauchline Rural - 02	0%	0%	100%	33.0
Carrick South - 06	26%	10%	63%	33.0
Girvan Ailsa - 01	27%	6%	66%	33.0
Troon - 04	15%	5%	78%	32.5
Ayr North Harbour, Wallacetown and Newton South - 02	24%	4%	69%	32.1
Prestwick West - 04	15%	6%	74%	31.7
Prestwick West - 05	18%	9%	68%	31.3
Troon - 03	18%	5%	70%	30.7
Carrick South - 07	21%	15%	57%	30.7
Prestwick East - 03	23%	9%	57%	29.3
Carrick South - 03	21%	6%	60%	28.9
Newton North - 06	28%	3%	55%	28.9
Carrick South - 04	19%	13%	52%	28.2
Belmont - 01	13%	11%	59%	27.6
Carrick North - 01	13%	11%	58%	27.5
Maybole - 07	12%	12%	59%	27.4
Carrick North - 03	26%	12%	44%	27.1
Carrick South - 01	17%	8%	56%	26.9
Troon - 06	9%	12%	59%	26.7
Troon - 07	9%	11%	60%	26.6
Belmont - 06	10%	11%	59%	26.5

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
Ayr South Harbour and Town Centre - 07	10%	15%	55%	26.4
Barassie - 01	15%	3%	61%	26.4
Newton North - 04	16%	5%	57%	25.9
Maybole - 06	11%	10%	56%	25.6
Ayr North Harbour, Wallacetown and Newton South - 01	25%	4%	48%	25.6
Ayr South Harbour and Town Centre - 04	12%	13%	50%	24.9
Prestwick East - 01	18%	3%	51%	24.1
Carrick South - 05	17%	7%	48%	23.6
Troon - 02	19%	5%	46%	23.3
Prestwick West - 01	11%	5%	55%	23.2
Annbank, Mossblown and Tarbolton - the Coalfields - 02	14%	3%	52%	22.8
Maybole - 01	21%	3%	43%	22.1
Alloway and Doonfoot - 01	12%	5%	50%	22.1
Alloway and Doonfoot - 07	2%	2%	62%	22.0
Prestwick East - 06	19%	2%	45%	21.7
Barassie - 06	5%	2%	56%	21.1
Alloway and Doonfoot - 08	7%	8%	49%	21.1
Dundonald, Loans and Symington - 02	16%	6%	40%	20.5
Alloway and Doonfoot - 06	4%	3%	54%	20.2
Muirhead - 08	5%	4%	52%	20.1
Alloway and Doonfoot - 05	2%	5%	54%	19.9
Prestwick West - 06	12%	3%	45%	19.9
Holmston and Forehill - 02	9%	6%	45%	19.8
Maybole - 03	15%	4%	39%	19.6
Muirhead - 05	1%	8%	51%	19.5
Muirhead - 06	16%	2%	39%	18.9
Holmston and Forehill - 05	14%	1%	40%	18.6
Maybole - 02	10%	5%	40%	18.5
Girvan Ailsa - 04	9%	8%	39%	18.4
Belmont - 07	9%	3%	43%	18.3
Prestwick Airport and Monkton - 02	20%	2%	32%	18.1
Troon - 05	11%	1%	42%	17.9
Prestwick Airport and Monkton - 01	10%	5%	39%	17.8
Annbank, Mossblown and Tarbolton - the Coalfields - 07	9%	7%	37%	17.7
Prestwick East - 04	15%	2%	36%	17.7
Craigie - 01	8%	1%	42%	17.1
Newton North - 02	10%	1%	40%	17.0
Barassie - 03	9%	2%	40%	16.9
Maybole - 04	10%	5%	37%	16.8
Troon - 01	3%	3%	45%	16.8
Newton North - 01	8%	3%	40%	16.6
Dundonald, Loans and Symington - 05	23%	7%	19%	16.5
Annbank, Mossblown and Tarbolton - the Coalfields - 05	11%	3%	35%	16.4

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
Muirhead - 04	4%	6%	40%	16.4
Dundonald, Loans and Symington - 06	9%	5%	35%	16.4
Prestwick Airport and Monkton - 04	6%	3%	40%	16.1
Prestwick East - 07	12%	2%	34%	15.8
Alloway and Doonfoot - 04	6%	3%	38%	15.5
Coylton - 05	5%	8%	34%	15.4
Castlehill and Kincaidston - 02	10%	3%	32%	15.3
Alloway and Doonfoot - 03	9%	3%	34%	15.3
Belmont - 03	7%	9%	29%	14.9
Lochside, Braehead and Whitletts - 06	9%	3%	31%	14.4
Carrick North - 04	8%	5%	30%	14.3
Muirhead - 07	13%	1%	28%	14.1
Muirhead - 03	8%	1%	33%	14.0
Castlehill and Kincaidston - 06	8%	6%	28%	14.0
Dalmilling - 01	7%	4%	31%	13.9
Coylton - 02	9%	2%	32%	13.9
Coylton - 04	9%	1%	31%	13.7
Annbank, Mossblown and Tarbolton - the Coalfields - 03	5%	3%	33%	13.5
Belmont - 05	6%	3%	31%	13.1
Heathfield - 04	5%	3%	31%	13.0
Holmston and Forehill - 03	4%	4%	30%	12.5
Annbank, Mossblown and Tarbolton - the Coalfields - 06	8%	4%	26%	12.5
Castlehill and Kincaidston - 07	6%	5%	26%	12.4
Dundonald, Loans and Symington - 03	3%	4%	30%	12.3
Prestwick Airport and Monkton - 03	2%	5%	30%	12.3
Belmont - 02	8%	8%	21%	12.3
Ayr North Harbour, Wallacetown and Newton South - 03	8%	4%	25%	12.2
Newton North - 05	10%	2%	23%	12.0
Alloway and Doonfoot - 02	0%	5%	31%	12.0
Ayr North Harbour, Wallacetown and Newton South - 04	8%	3%	25%	11.7
Ayr North Harbour, Wallacetown and Newton South - 06	5%	2%	28%	11.6
Castlehill and Kincaidston - 04	13%	4%	17%	11.4
Heathfield - 06	2%	2%	30%	11.2
Holmston and Forehill - 04	7%	5%	21%	10.9
Castlehill and Kincaidston - 05	4%	3%	25%	10.8
Dundonald, Loans and Symington - 01	10%	3%	18%	10.7
Annbank, Mossblown and Tarbolton - the Coalfields - 04	10%	4%	18%	10.4
Coylton - 01	3%	2%	26%	10.2
Prestwick East - 05	6%	5%	19%	10.0
Holmston and Forehill - 07	2%	2%	26%	9.8
Coylton - 03	4%	4%	21%	9.7
Holmston and Forehill - 06	8%	4%	17%	9.6

Data zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Total Weighted Score for Energy Efficiency
Lochside, Braehead and Whitletts - 05	5%	1%	23%	9.6
Muirhead - 02	10%	1%	17%	9.5
Castlehill and Kincaidston - 01	6%	2%	20%	9.5
Ayr North Harbour, Wallacetown and Newton South - 05	3%	6%	20%	9.5
Heathfield - 05	5%	3%	21%	9.3
Lochside, Braehead and Whitletts - 04	7%	2%	19%	9.1
Craigie - 03	4%	1%	20%	8.4
Carrick North - 02	8%	2%	15%	8.1
Holmston and Forehill - 01	3%	3%	19%	8.1
Girvan Glendoune - 05	2%	2%	21%	8.0
Castlehill and Kincaidston - 03	8%	2%	14%	7.9
Girvan Glendoune - 03	5%	3%	15%	7.8
Dundonald, Loans and Symington - 04	8%	0%	15%	7.7
Newton North - 03	4%	2%	17%	7.7
Muirhead - 01	5%	3%	15%	7.5
Barassie - 04	7%	3%	13%	7.4
Heathfield - 01	3%	3%	16%	7.4
Heathfield - 02	4%	0%	17%	7.3
Annbank, Mossblown and Tarbolton - the Coalfields - 01	12%	3%	6%	7.0
Girvan Glendoune - 01	6%	4%	11%	6.8
Barassie - 05	6%	2%	11%	6.7
Barassie - 02	4%	2%	13%	6.4
Lochside, Braehead and Whitletts - 03	4%	1%	13%	6.2
Dundonald, Loans and Symington - 07	2%	2%	15%	6.2
Craigie - 02	6%	1%	11%	6.0
Dalmilling - 02	8%	3%	7%	5.9
Girvan Glendoune - 04	3%	1%	13%	5.8
Lochside, Braehead and Whitletts - 02	6%	2%	9%	5.7
Girvan Glendoune - 02	2%	5%	9%	5.4
Lochside, Braehead and Whitletts - 01	4%	2%	9%	5.0
Dalmilling - 04	2%	1%	12%	4.7
Maybole - 05	2%	0%	12%	4.7
Dalmilling - 03	5%	2%	7%	4.6
Carrick North - 05	1%	2%	12%	4.6
Heathfield - 03	2%	1%	6%	2.9
Ayr South Harbour and Town Centre - 01	1%	0%	0%	0.3

Domestic Fuel Poverty Resulting from Poor Energy Efficiency

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

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

Table 21 lists all the zones and is the companion to Figure 21.

Table 22: Fuel Poverty Weighted Scores by Data Zones

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Households in extreme fuel poverty (fuel bill >20 % of income after housing)	Total Weighted Score
Carrick South - 02	25%	12%	73%	35%	49%	35.4
Ayr South Harbour and Town Centre - 02	20%	35%	74%	27%	18%	34.5
Girvan Ailsa - 05	24%	8%	68%	34%	26%	33.5
Carrick South - 03	21%	6%	60%	38%	74%	33.1
Carrick South - 06	26%	10%	63%	34%	42%	33.1
Girvan Ailsa - 02	35%	7%	76%	26%	11%	32.0
Girvan Ailsa - 01	27%	6%	66%	31%	19%	31.7
Carrick South - 01	17%	8%	56%	37%	47%	31.6
Carrick South - 05	17%	7%	48%	38%	69%	30.7
Girvan Ailsa - 03	24%	9%	74%	26%	12%	30.6
Ayr South Harbour and Town Centre - 06	20%	30%	77%	16%	0%	28.9
Carrick North - 01	13%	11%	58%	30%	33%	28.5
Ayr South Harbour and Town Centre - 03	13%	26%	75%	18%	1%	27.6
Troon - 04	15%	5%	78%	22%	5%	27.1
Ayr South Harbour and Town Centre - 04	12%	13%	50%	30%	18%	27.1
Carrick South - 07	21%	15%	57%	24%	8%	27.0
Prestwick West - 02	24%	10%	75%	18%	1%	26.8
Ayr South Harbour and Town Centre - 05	21%	25%	74%	14%	0%	26.7
Maybole - 06	11%	10%	56%	27%	15%	26.3
Girvan Ailsa - 04	9%	8%	39%	34%	18%	26.0
Ayr North Harbour, Wallacetown and Newton South - 02	24%	4%	69%	20%	3%	25.6
Annbank, Mossblown and Tarbolton - the Coalfields - 02	14%	3%	52%	29%	17%	25.5
Maybole - 01	21%	3%	43%	29%	18%	25.2
Prestwick West - 03	29%	5%	76%	14%	0%	25.1

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Households in extreme fuel poverty (fuel bill >20 % of income after housing)	Total Weighted Score
Ayr North Harbour, Wallacetown and Newton South - 01	25%	4%	48%	25%	9%	25.0
Prestwick West - 04	15%	6%	74%	19%	2%	24.9
Carrick North - 03	26%	12%	44%	23%	8%	24.9
Maybole - 03	15%	4%	39%	30%	19%	24.8
Maybole - 02	10%	5%	40%	31%	22%	24.8
Troon - 03	18%	5%	70%	19%	4%	24.6
Belmont - 04	16%	12%	83%	13%	1%	24.5
Craigie - 01	8%	1%	42%	32%	38%	24.2
Prestwick East - 02	28%	7%	74%	13%	0%	24.1
Girvan Glendoune - 02	2%	5%	9%	42%	31%	23.8
Girvan Glendoune - 04	3%	1%	13%	42%	38%	23.7
Mauchline Rural - 02	0%	0%	100%	15%	0%	23.7
Belmont - 01	13%	11%	59%	20%	6%	23.5
Newton North - 06	28%	3%	55%	18%	2%	23.3
Ayr North Harbour, Wallacetown and Newton South - 03	8%	4%	25%	34%	28%	23.2
Barassie - 06	5%	2%	56%	26%	7%	23.2
Barassie - 03	9%	2%	40%	29%	18%	23.0
Prestwick West - 05	18%	9%	68%	14%	0%	22.5
Heathfield - 04	5%	3%	31%	32%	19%	22.2
Girvan Glendoune - 03	5%	3%	15%	37%	29%	22.2
Ayr North Harbour, Wallacetown and Newton South - 05	3%	6%	20%	35%	33%	22.1
Barassie - 01	15%	3%	61%	18%	2%	22.0
Lochside, Braehead and Whitletts - 02	6%	2%	9%	38%	31%	21.9
Prestwick East - 06	19%	2%	45%	23%	7%	21.9
Ayr North Harbour, Wallacetown and Newton South - 04	8%	3%	25%	32%	29%	21.8
Dalmilling - 01	7%	4%	31%	30%	17%	21.8
Girvan Glendoune - 01	6%	4%	11%	37%	19%	21.7
Annbank, Mossblown and Tarbolton - the Coalfields - 07	9%	7%	37%	26%	15%	21.5
Ayr North Harbour, Wallacetown and Newton South - 06	5%	2%	28%	32%	22%	21.5
Prestwick East - 01	18%	3%	51%	19%	4%	21.4
Annbank, Mossblown and Tarbolton - the Coalfields - 05	11%	3%	35%	27%	17%	21.3
Annbank, Mossblown and Tarbolton - the Coalfields - 06	8%	4%	26%	30%	32%	21.2

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Households in extreme fuel poverty (fuel bill >20 % of income after housing)	Total Weighted Score
Lochside, Braehead and Whitletts - 03	4%	1%	13%	36%	31%	21.0
Maybole - 04	10%	5%	37%	25%	14%	21.0
Troon - 07	9%	11%	60%	15%	1%	20.8
Prestwick East - 03	23%	9%	57%	13%	0%	20.7
Lochside, Braehead and Whitletts - 06	9%	3%	31%	27%	13%	20.7
Prestwick Airport and Monkton - 04	6%	3%	40%	26%	10%	20.7
Maybole - 07	12%	12%	59%	14%	0%	20.6
Holmston and Forehill - 02	9%	6%	45%	21%	9%	20.2
Ayr South Harbour and Town Centre - 07	10%	15%	55%	14%	0%	20.2
Prestwick West - 01	11%	5%	55%	18%	2%	20.2
Troon - 06	9%	12%	59%	14%	0%	20.1
Newton North - 04	16%	5%	57%	15%	0%	20.0
Lochside, Braehead and Whitletts - 04	7%	2%	19%	31%	21%	19.8
Dalmilling - 03	5%	2%	7%	35%	33%	19.6
Castlehill and Kincaidston - 04	13%	4%	17%	28%	12%	19.5
Muirhead - 01	5%	3%	15%	32%	29%	19.5
Dundonald, Loans and Symington - 02	16%	6%	40%	18%	1%	19.3
Belmont - 06	10%	11%	59%	12%	0%	19.2
Castlehill and Kincaidston - 06	8%	6%	28%	24%	14%	19.1
Troon - 05	11%	1%	42%	20%	5%	18.9
Muirhead - 06	16%	2%	39%	18%	1%	18.4
Lochside, Braehead and Whitletts - 05	5%	1%	23%	27%	22%	18.4
Dalmilling - 04	2%	1%	12%	32%	22%	18.4
Lochside, Braehead and Whitletts - 01	4%	2%	9%	32%	18%	18.3
Newton North - 02	10%	1%	40%	20%	1%	18.2
Prestwick Airport and Monkton - 02	20%	2%	32%	18%	0%	18.1
Dundonald, Loans and Symington - 04	8%	0%	15%	29%	26%	18.0
Craigie - 03	4%	1%	20%	28%	12%	18.0
Castlehill and Kincaidston - 05	4%	3%	25%	25%	8%	17.9
Alloway and Doonfoot - 08	7%	8%	49%	15%	0%	17.7
Troon - 02	19%	5%	46%	13%	0%	17.7
Prestwick East - 05	6%	5%	19%	25%	11%	17.6
Annbank, Mossblown and Tarbolton - the Coalfields - 03	5%	3%	33%	22%	5%	17.5
Prestwick East - 04	15%	2%	36%	17%	0%	17.4
Alloway and Doonfoot - 01	12%	5%	50%	13%	0%	17.2

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Households in extreme fuel poverty (fuel bill >20 % of income after housing)	Total Weighted Score
Prestwick West - 06	12%	3%	45%	15%	0%	17.1
Alloway and Doonfoot - 07	2%	2%	62%	13%	0%	17.1
Coylton - 05	5%	8%	34%	19%	2%	17.0
Prestwick Airport and Monkton - 01	10%	5%	39%	16%	0%	16.9
Dundonald, Loans and Symington - 06	9%	5%	35%	17%	1%	16.7
Annbank, Mossblown and Tarbolton - the Coalfields - 04	10%	4%	18%	23%	11%	16.7
Newton North - 01	8%	3%	40%	17%	0%	16.6
Belmont - 05	6%	3%	31%	20%	2%	16.6
Dundonald, Loans and Symington - 03	3%	4%	30%	21%	8%	16.6
Belmont - 02	8%	8%	21%	21%	7%	16.6
Girvan Glendoune - 05	2%	2%	21%	25%	14%	16.6
Dundonald, Loans and Symington - 05	23%	7%	19%	16%	0%	16.4
Annbank, Mossblown and Tarbolton - the Coalfields - 01	12%	3%	6%	26%	14%	16.4
Coylton - 01	3%	2%	26%	23%	11%	16.3
Alloway and Doonfoot - 05	2%	5%	54%	13%	0%	16.3
Heathfield - 05	5%	3%	21%	23%	13%	16.3
Alloway and Doonfoot - 06	4%	3%	54%	13%	0%	16.1
Belmont - 03	7%	9%	29%	18%	1%	16.1
Muirhead - 08	5%	4%	52%	12%	0%	16.0
Dalmilling - 02	8%	3%	7%	26%	18%	15.8
Coylton - 04	9%	1%	31%	18%	1%	15.7
Prestwick East - 07	12%	2%	34%	16%	0%	15.7
Castlehill and Kincaidston - 07	6%	5%	26%	19%	1%	15.6
Muirhead - 05	1%	8%	51%	12%	0%	15.6
Muirhead - 02	10%	1%	17%	22%	6%	15.5
Holmston and Forehill - 05	14%	1%	40%	13%	0%	15.5
Holmston and Forehill - 06	8%	4%	17%	21%	7%	15.5
Barassie - 02	4%	2%	13%	24%	9%	15.3
Belmont - 07	9%	3%	43%	13%	0%	15.3
Heathfield - 06	2%	2%	30%	20%	1%	15.2
Heathfield - 01	3%	3%	16%	23%	10%	15.2
Maybole - 05	2%	0%	12%	25%	12%	14.8
Craigie - 02	6%	1%	11%	24%	7%	14.8
Holmston and Forehill - 04	7%	5%	21%	19%	1%	14.8
Troon - 01	3%	3%	45%	13%	0%	14.6

Data Zone	Percentage of lofts with less than 99mm insulation	Percentage of windows which are single glazed	Percentage of walls which are uninsulated	Households in fuel poverty (fuel bill >10 % of income after housing)	Households in extreme fuel poverty (fuel bill >20 % of income after housing)	Total Weighted Score
Muirhead - 04	4%	6%	40%	13%	0%	14.4
Carrick North - 04	8%	5%	30%	14%	0%	14.2
Coylton - 02	9%	2%	32%	15%	0%	14.1
Castlehill and Kincaidston - 03	8%	2%	14%	20%	2%	14.1
Prestwick Airport and Monkton - 03	2%	5%	30%	16%	0%	14.0
Alloway and Doonfoot - 03	9%	3%	34%	13%	1%	13.9
Alloway and Doonfoot - 04	6%	3%	38%	13%	0%	13.9
Dundonald, Loans and Symington - 01	10%	3%	18%	17%	1%	13.9
Castlehill and Kincaidston - 02	10%	3%	32%	13%	0%	13.8
Muirhead - 07	13%	1%	28%	13%	0%	13.5
Holmston and Forehill - 03	4%	4%	30%	14%	0%	13.3
Newton North - 05	10%	2%	23%	15%	0%	13.2
Muirhead - 03	8%	1%	33%	13%	0%	13.2
Newton North - 03	4%	2%	17%	18%	1%	13.0
Barassie - 05	6%	2%	11%	19%	0%	12.9
Carrick North - 02	8%	2%	15%	18%	3%	12.9
Alloway and Doonfoot - 02	0%	5%	31%	14%	0%	12.6
Barassie - 04	7%	3%	13%	17%	0%	12.2
Holmston and Forehill - 07	2%	2%	26%	14%	0%	11.9
Coylton - 03	4%	4%	21%	14%	0%	11.9
Holmston and Forehill - 01	3%	3%	19%	16%	0%	11.8
Castlehill and Kincaidston - 01	6%	2%	20%	13%	0%	11.0
Heathfield - 02	4%	0%	17%	14%	0%	10.8
Dundonald, Loans and Symington - 07	2%	2%	15%	14%	0%	10.3
Carrick North - 05	1%	2%	12%	14%	0%	9.4
Ayr South Harbour and Town Centre - 01	1%	0%	0%	18%	1%	9.0
Heathfield - 03	2%	1%	6%	14%	0%	8.6

Appendix EOff-gas grid and On-gas grid

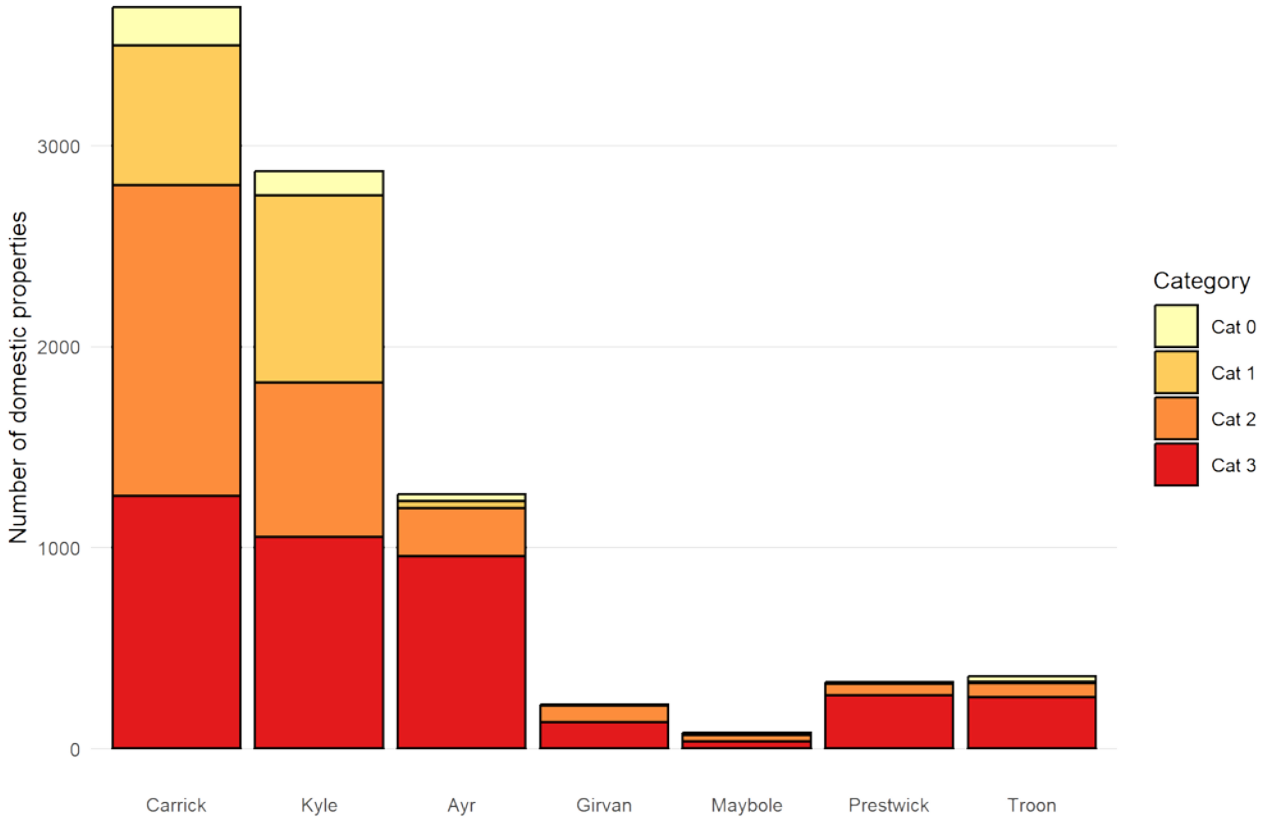
The domestic baseline tool outlines a method of categorising properties based on their suitability for heat pumps. While this report uses an alternative methodology as set out in section 7.7.3, the, this appendix sets out the findings of the methodology set out in the baseline tool.

Off-gas grid

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

Figure 49 shows that most off-grid properties sit in Category 3, meaning that there is a potential challenge to convert these to efficient heat-pump systems.

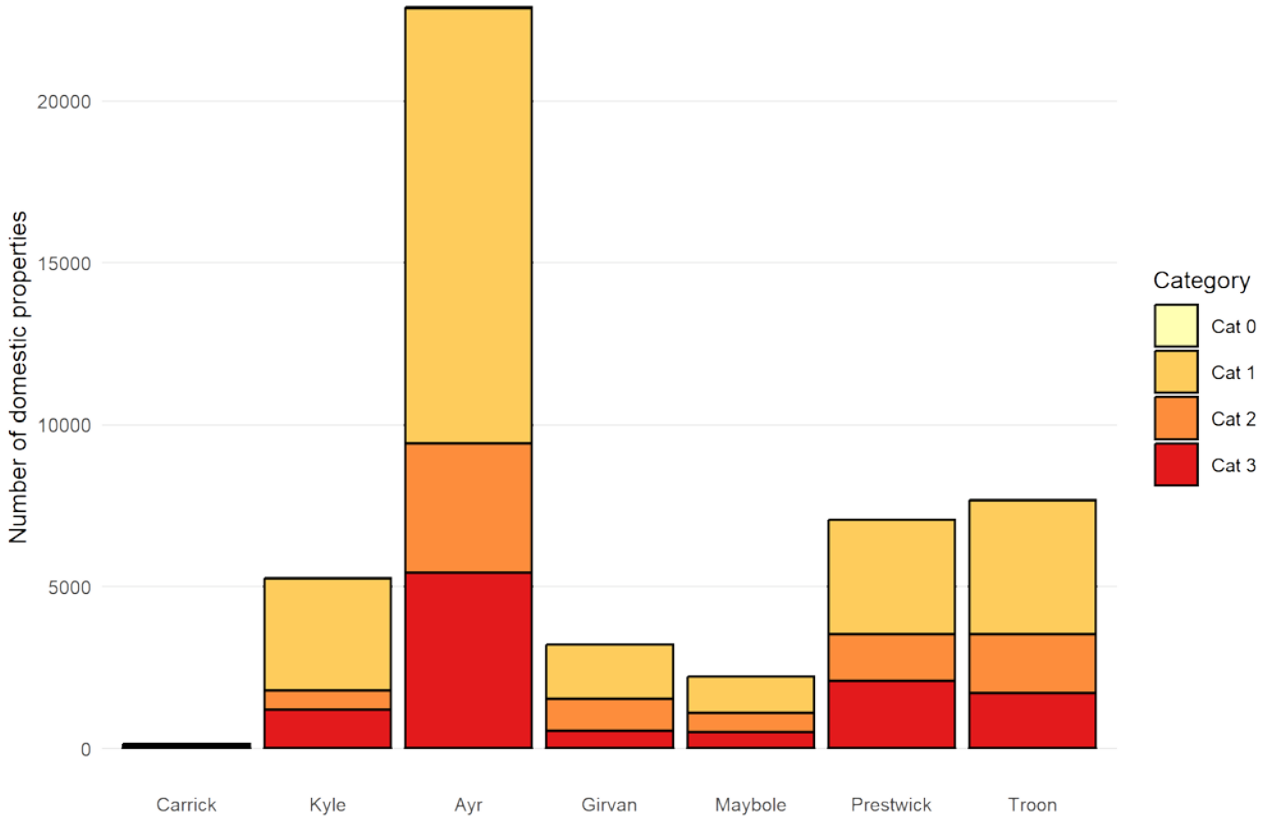
Figure 49: Heat transition categories for off-gas grid domestic properties



On-gas grid

On-gas grid buildings are similarly categorised by the Domestic Baseline Tool although it might be expected that more on-grid properties will find themselves in areas with heat networks and a connection to these rather than heat pumps might be likely. Most properties are in Categories 1 and 2 (Figure 50) and so lend themselves to transition, although Ayr has a large proportion of Category 3 homes.

Figure 50: Heat transition categories for on-gas grid domestic properties



Appendix F Heat Network Zone Maps

Figure 51 Ayr heat network zones – 4,000kWh/m (baseline)

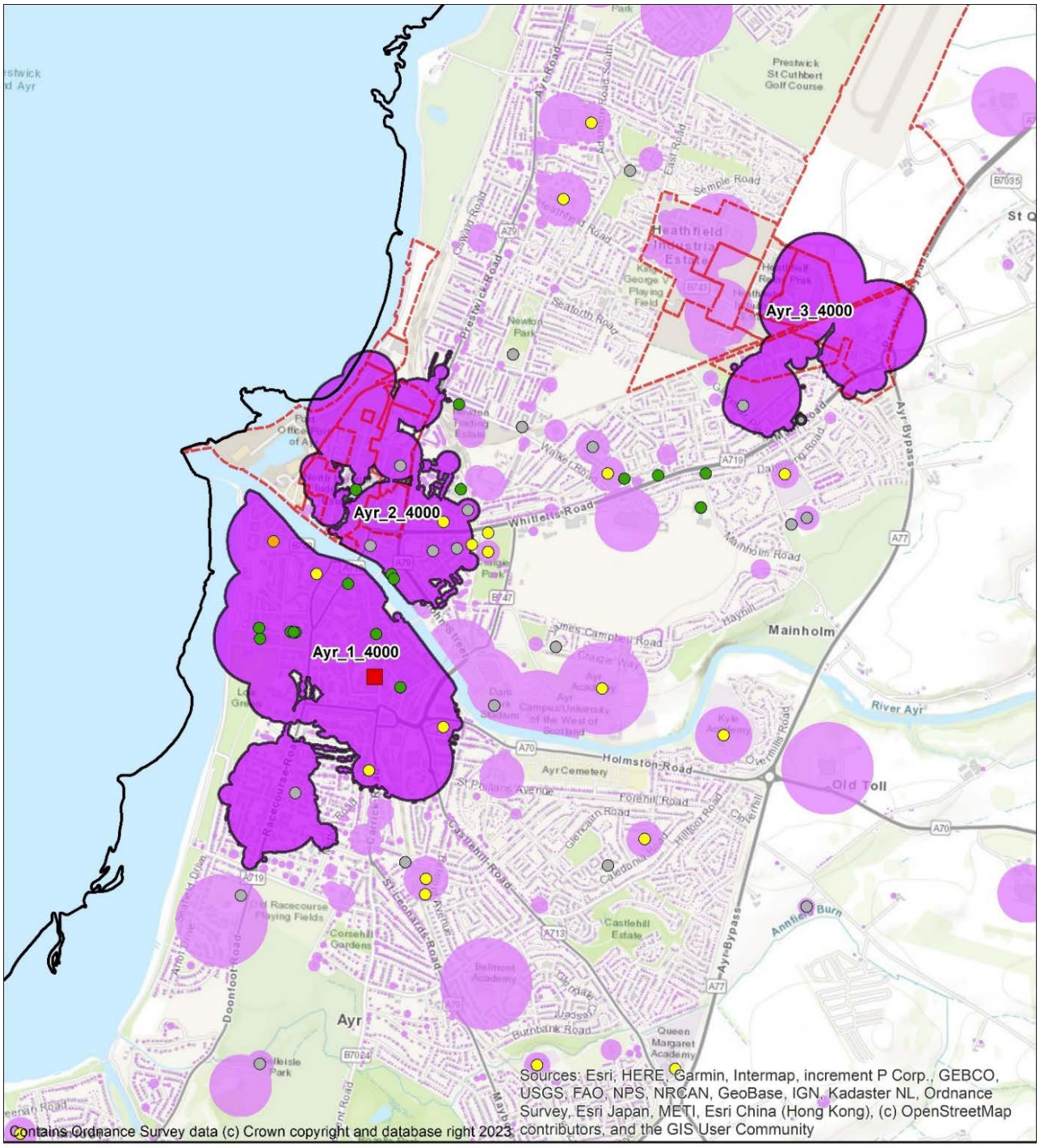


Figure 52 Ayr Heat network zones - 8,000kWh/m (Stringent)

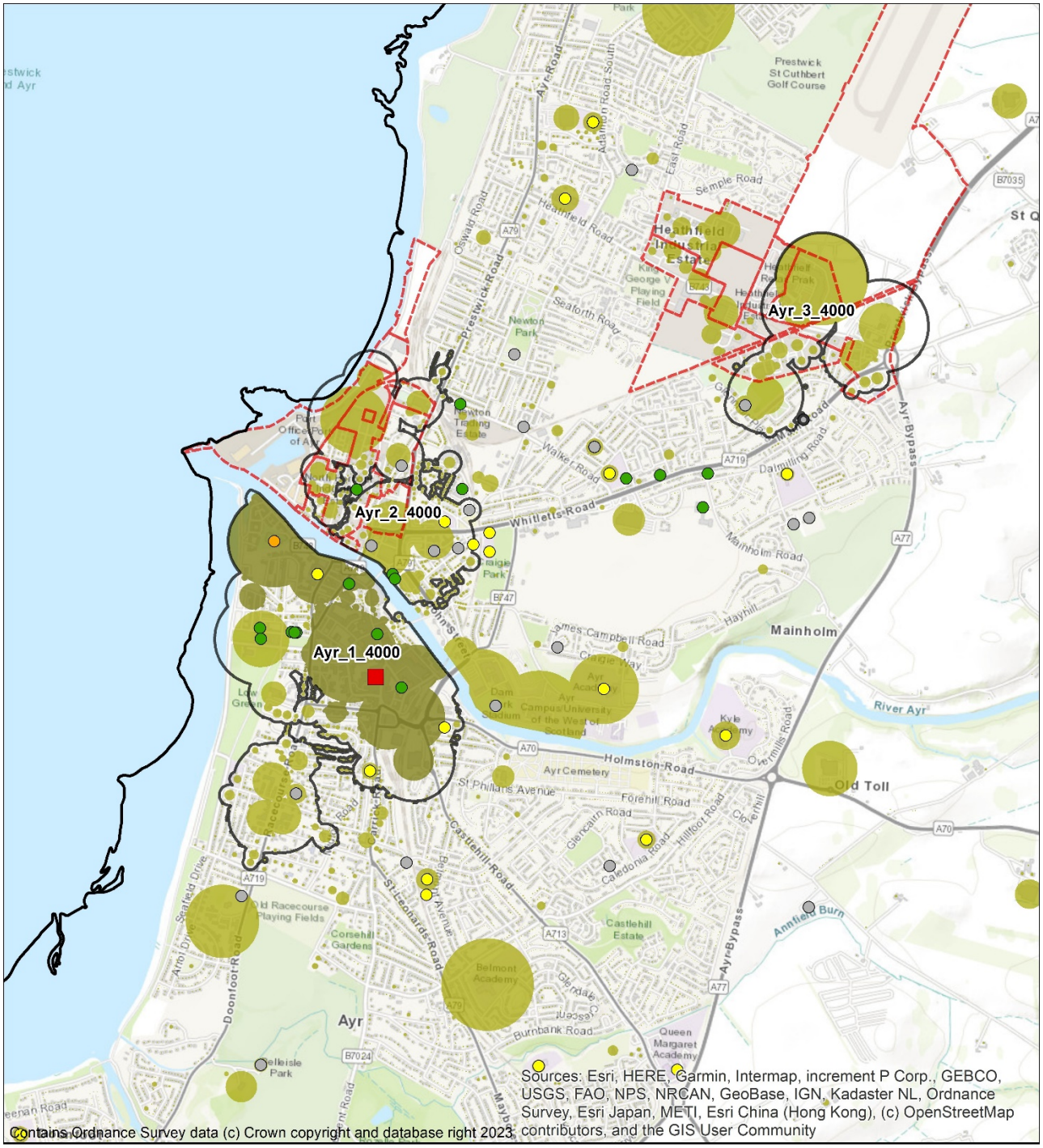


Figure 53 Girvan heat network zone (industrial) – 4,000kWh/m (baseline)

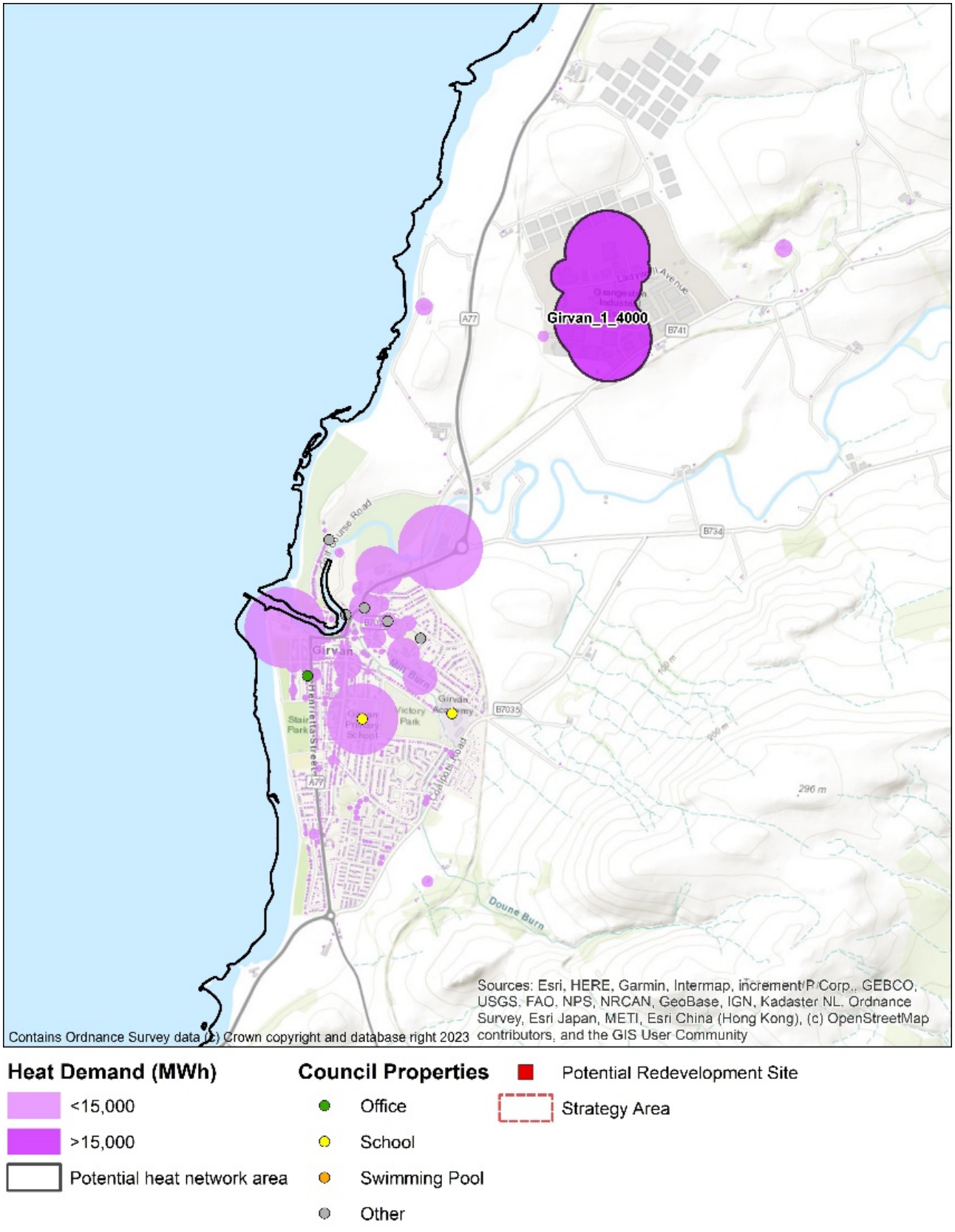
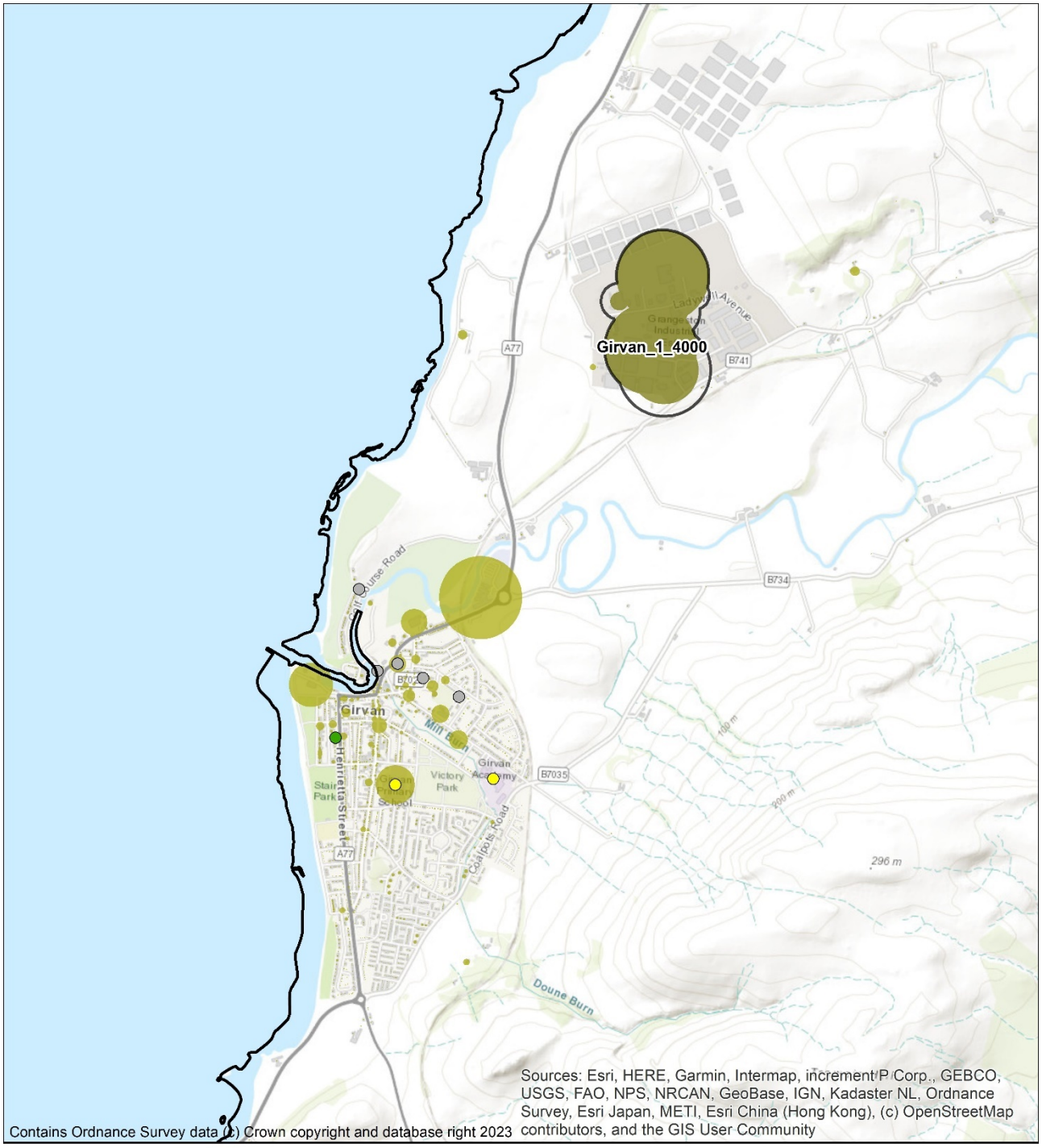


Figure 54 Girvan heat network zone (industrial) - 8,000kWh/m (baseline)



Appendix G Heat Pump Suitability Maps

The maps in this appendix highlight, using the methodology described in 7.7.3, which homes are ready for heat pumps today (green), will be ready with modest energy efficiency interventions (orange) and may be more difficult to convert (red).

Figure 55: Heat pump suitability map- Ayr

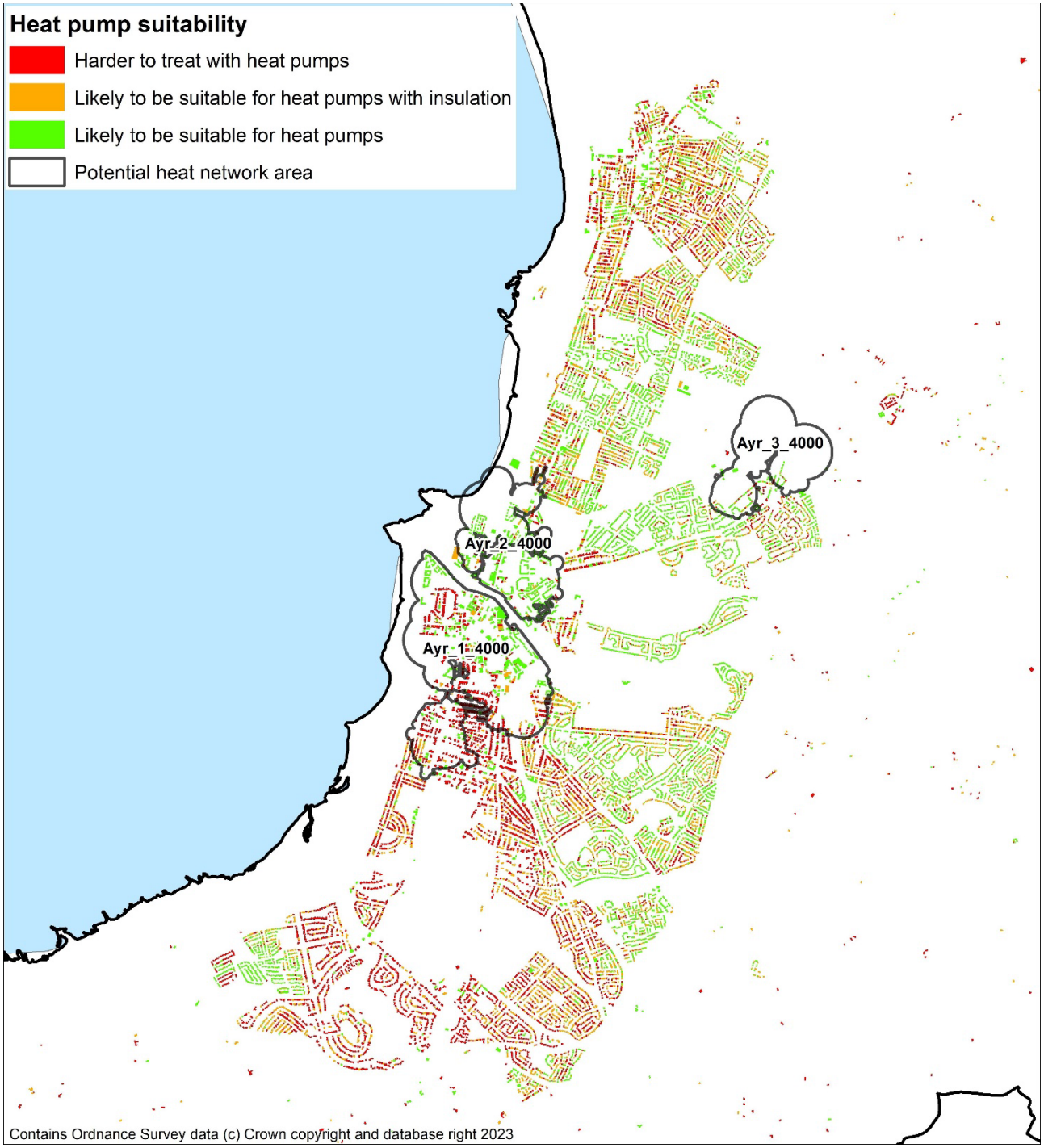


Figure 56: Heat pump suitability map- Girvan

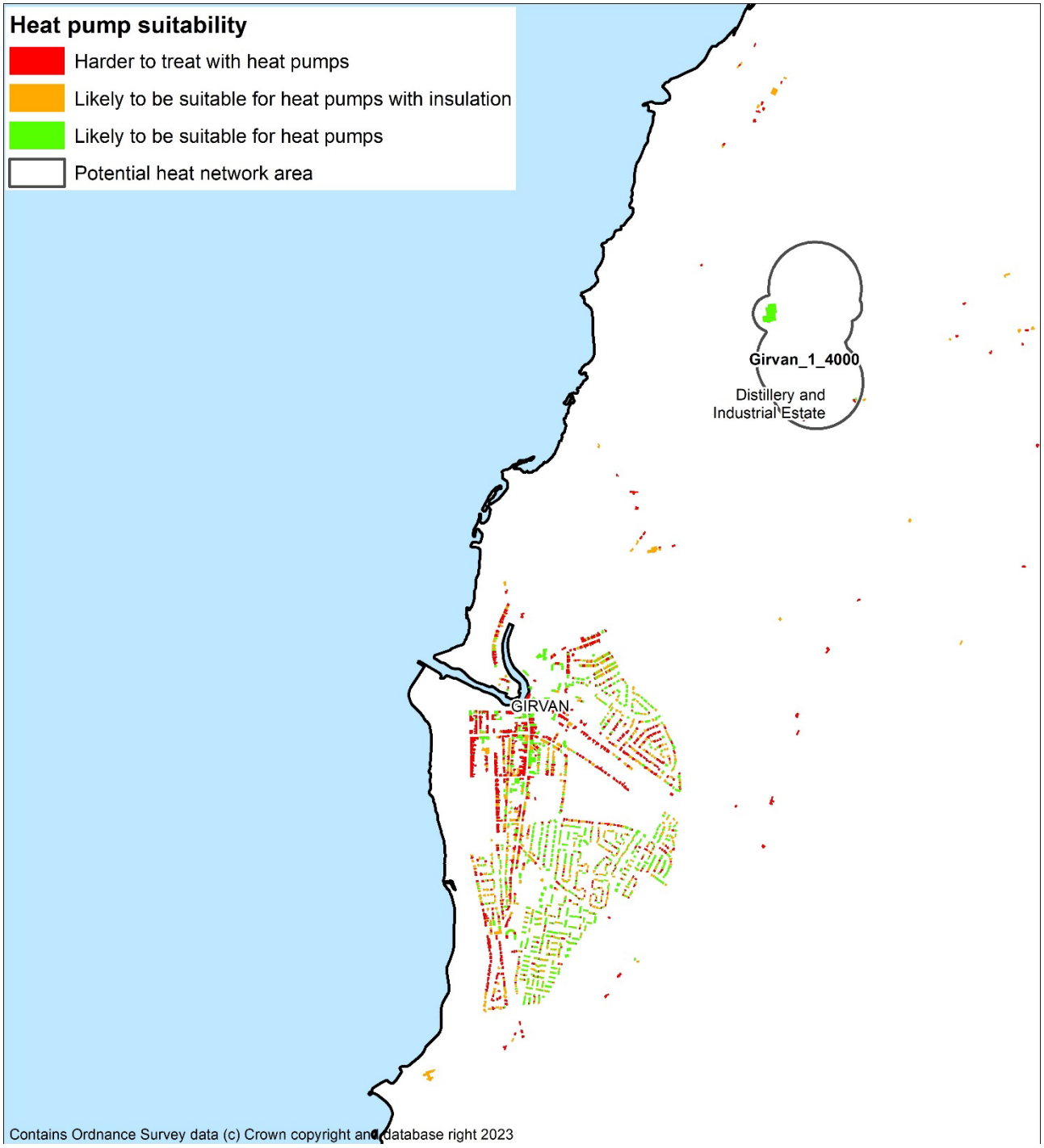


Figure 57: Heat pump suitability map- Troon

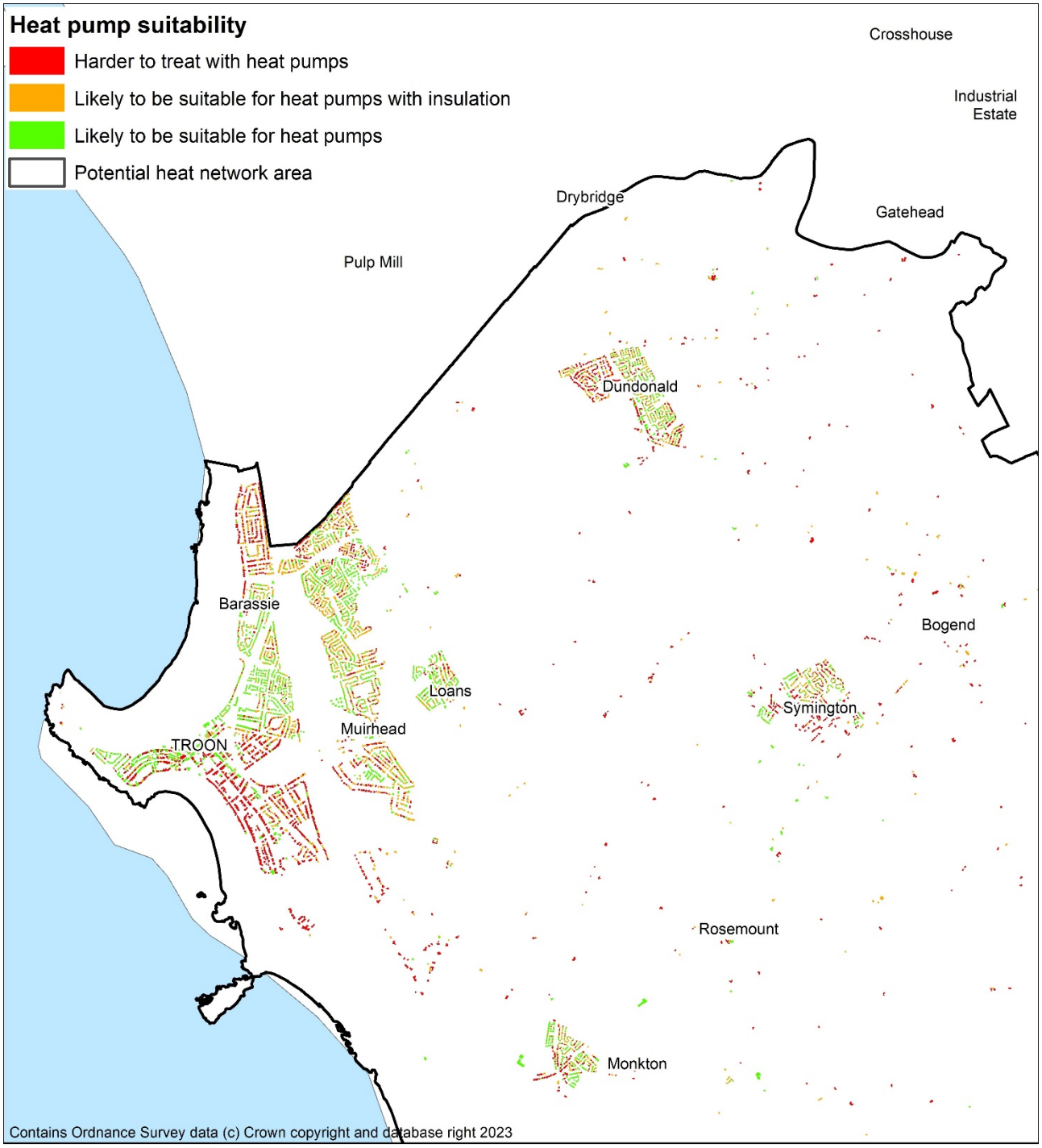


Figure 58: Heat pump suitability map- Maybole

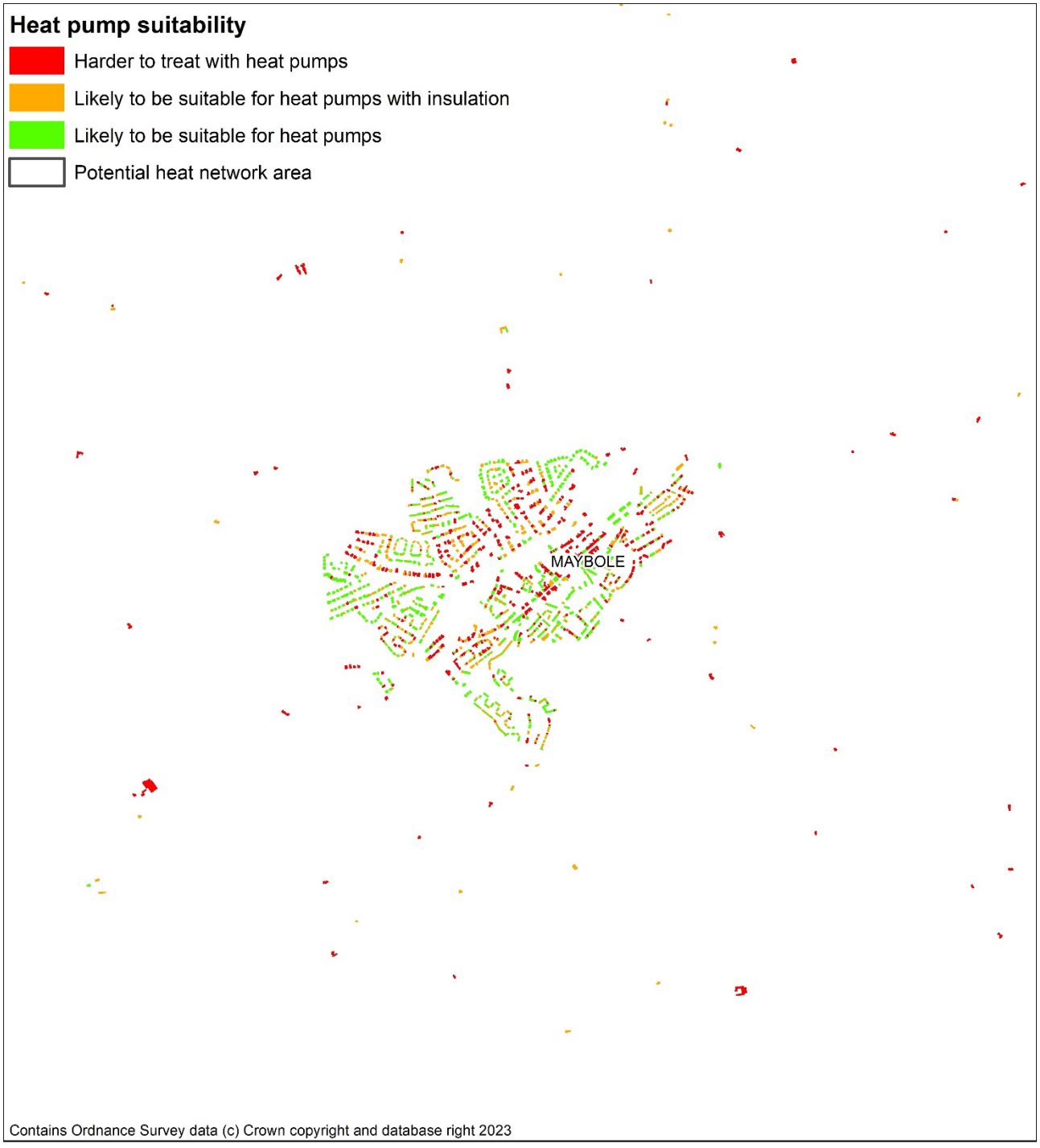


Figure 59: Heat pump suitability map- Ballantrae

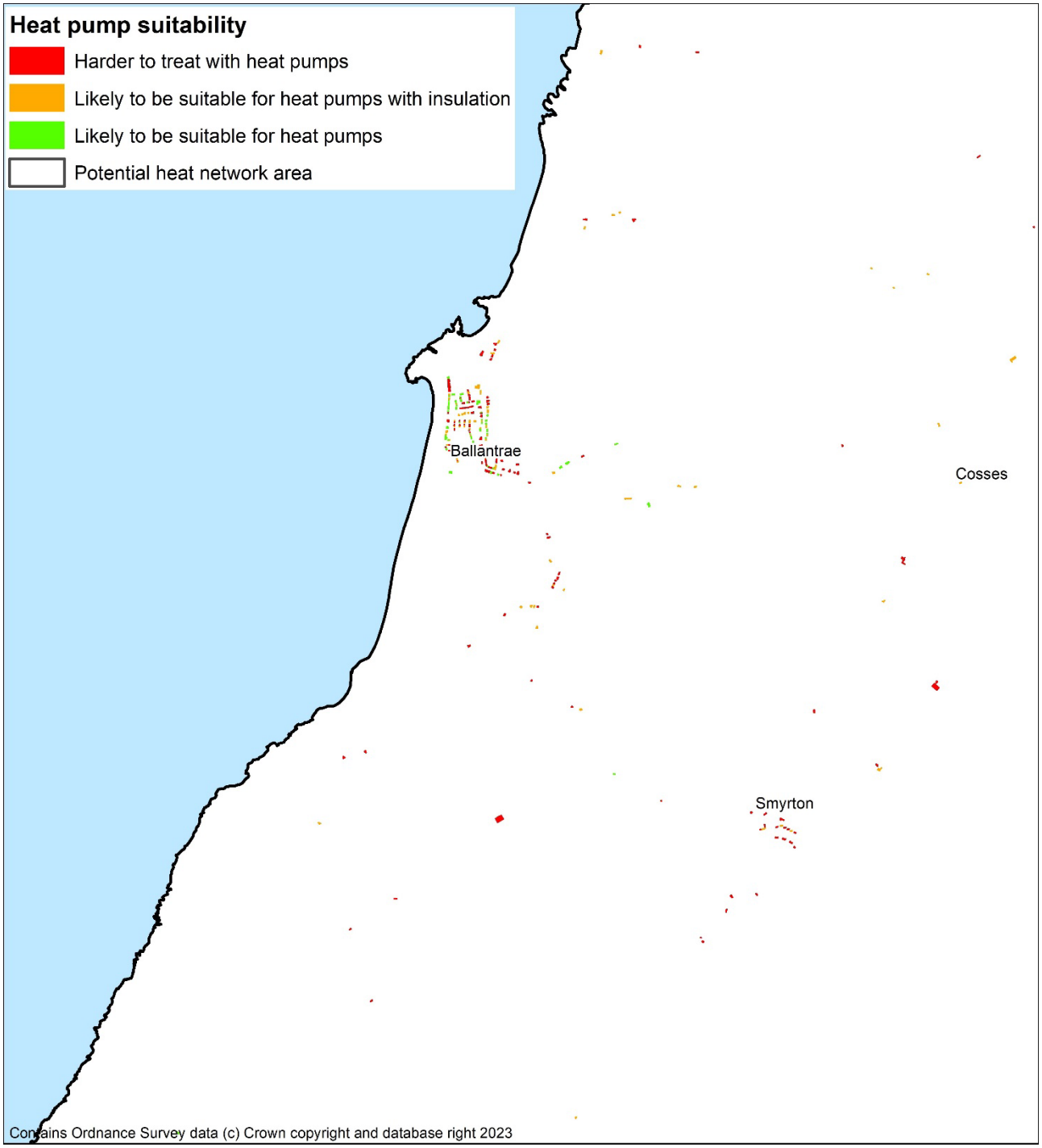
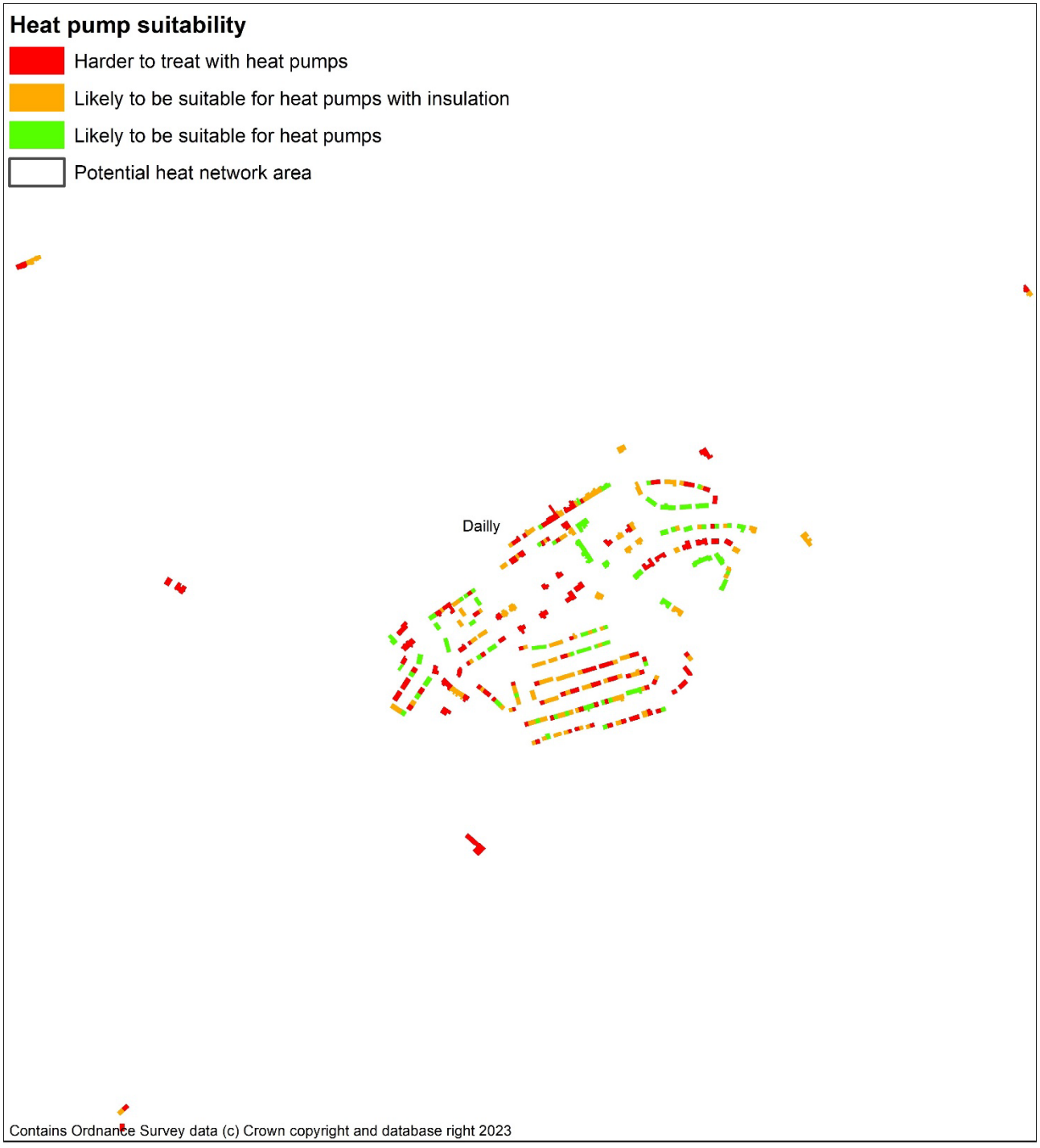


Figure 60: Heat pump suitability map- Dailly



Appendix H Default indicators and calculation weightings

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

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

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

Theme	Indicator	Criteria	Weighting	Description	Data source. if known
Building energy efficiency	Loft insulation	<100mm (prediction) (Yes)	33.33%	Binary identifier. Used to identify properties with a low energy efficiency, properties with no or minimal loft insulation.	Home Analytics
	Single glazed windows	Binary (Yes)	33.33%	Binary identifier. Used to identify properties with a low energy efficiency, properties with single glazed windows.	Home Analytics
	Wall insulation prediction (all construction types)	Binary (Uninsulated)	33.33%	Binary identifier. Used to identify properties with a low energy efficiency, properties with uninsulated walls.	Home Analytics
Additional example Indicators that could be used to support Delivery Level Area identification as part of LHEES stage 4 and Delivery Plan	Tenure type	User defined		Four types; housing association, owner/ occupier, private rented, local authority. User can filter by interest.	Home Analytics
	Building age	User defined		Defined in six age brackets. User can filter by interest.	Home Analytics
	Non-traditional build design type	Solid wall (binary)		User can filter by interest.	Home Analytics
	EPC Rating	E, F or G		User can filter by interest.	Home Analytics
Indicators of fuel poverty	Probability of fuel poverty	% likelihood	50%	50% is default but set to 0% if extreme fuel poverty is to be analysed.	Home Analytics

Theme	Indicator	Criteria	Weighting	Description	Data source. if known
	Probability of extreme fuel poverty	% likelihood	0%	0% is a default Weighting applied. User can adjust balance by selecting 0% or 50% to switch analysis focus between fuel poverty or extreme fuel poverty.	Home Analytics
Building energy efficiency	Loft insulation	<100mm (prediction) (Yes)	16.67%	Poor energy efficiency Indicators sum to 50% of overall Weighting, each have an equal Weighting.	Home Analytics
	Single glazed windows	Binary (Yes)	16.67%		Home Analytics
	Wall insulation prediction (all construction types)	Binary (Uninsulated)	16.67%		Home Analytics
Additional example Indicators that could be used to support Delivery Level Area identification as part of LHEES stage 4 and Delivery Plan	Tenure type	User defined		Four types; housing association, owner/ occupier, private rented, local authority. User can filter by interest.	Home Analytics
	Building age	User defined		Defined in six age brackets. User can filter by interest.	Home Analytics
	Non-traditional build design type	Solid wall (binary)		User can filter by interest.	Home Analytics
	EPC Rating	E, F or G		User can filter by interest.	Home Analytics

Appendix I Intervention Details

On- and Off-gas Grid

Intervention	1
Action Summary	1.1 Survey properties with missing data. 1.2 Install low carbon heating in off-gas grid buildings.
LHEES Considerations	1 Off- gas grid
Background	
Action Champion	
Internal stakeholders	
External stakeholders	
Property numbers	8,935
Technical considerations	
Skills Considerations	
Economic considerations	
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	
Links to existing projects	
Time	
Action Plan	
Geospatial	
Monitoring and evaluation	

Intervention	2
Action Summary	2.1 Survey properties with missing data. 2.2 Install low carbon heating in off-gas grid buildings.
LHEES Considerations	2 On- gas grid
Background	
Action Champion	
Internal stakeholders	
External stakeholders	
Property numbers	57,949
Technical considerations	
Skills Considerations	
Economic considerations	
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	
Links to existing projects	
Time	
Action Plan	
Geospatial	
Monitoring and evaluation	

Local Authority Interventions

Intervention Reference	3
Action Summary	3.1 Survey properties with missing data. 3.2 Upgrade all insulation to 300 mm mineral wool (or equivalent)
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Loft insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers
Property numbers	Ayr- 719, Carrick- 207, Girvan- 100, Kyle- 391, Maybole- 127, Prestwick- 194, Troon- 195.
Technical considerations	This is an established technology with several vendors and no supply bottlenecks.
Skills Considerations	This is an established practice with no specific skills requirement
Economic considerations	This is a low-cost investment with a lifespan exceeding that of the building.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	Works should be inspected on completion. The action champion shall maintain the property database and ensure that the "loft insulation thickness" is updated after each batch of inspections. The action champion shall report back to the LHEES team with lessons learned for other actions.

Intervention Reference	4
Action Summary	4.1 Assess priority 4.2 Assess feasibility 4.3 Install cavity or cladding insulation
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Wall insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers
Property numbers	Ayr- 409, Carrick- 77, Girvan- 50, Kyle- 110, Maybole- 87, Prestwick- 115, Troon- 150.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	Works should be inspected on completion. The action champion shall maintain the property database and ensure that the "wall insulation" is updated after each batch of inspections. The action champion shall report back to the LHEES team with lessons learned for other actions.

Intervention Reference	5
Action Summary	3.1 Assess priority 3.2 Assess feasibility 2.3 Install double glazing
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Double glazing is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers
Property numbers	Ayr- 88, Carrick- 20, Girvan- 20, Kyle- 23, Maybole- 16, Prestwick- 26, Troon- 20.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	Works should be inspected on completion. The action champion shall maintain the property database and ensure that the "glazing type" is updated after each batch of inspections. The action champion shall report back to the LHEES team with lessons learned for other actions.

Intervention Reference	6
Action Summary	6.1 Survey properties for wet heating installation requirements 6.2 Install ASHP
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing electric heating systems with ASHPs can reduce heating electricity consumption by 2 to 3-fold but requires a wet heating system to be installed.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers DNO
Property numbers	Ayr- 402, Carrick- 152, Girvan- 52, Kyle- 161, Maybole- 14, Prestwick- 35, Troon- 55.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	Works should be inspected on completion. Performance across the year in the first completed projects should be closely monitored to ensure that the ASHPs work as they ought to, or require adjustments to settings, and to ensure that the users are comfortable interacting with the controls.

Intervention Reference	7
Action Summary	7.1 Install ASHP
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing oil or LPG boilers with ASHPs will significantly reduce carbon emissions and cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers DNO
Property numbers	Ayr- 5, Carrick- 153, Girvan- 0, Kyle- 166, Maybole- 0, Prestwick- 1, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	Works should be inspected on completion. Performance across the year in the first completed projects should be closely monitored to ensure that the ASHPs work as they ought to, or require adjustments to settings, and to ensure that the users are comfortable interacting with the controls.

Intervention Reference	8
Action Summary	8.1 Install ASHP 8.2 Install electric cooker 8.3 Disconnect from gas network
LHEES Considerations	1 On gas grid 4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing gas boilers with ASHPs will reduce carbon emissions and switching to electric cooking to disconnect from the gas grid and avoid gas standing charges would reduce energy costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers DNO
Property numbers	Ayr- 3,788, Carrick- 97, Girvan- 647, Kyle- 705, Maybole- 506, Prestwick- 644, Troon- 879.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	Works should be inspected on completion. Performance across the year in the first completed projects should be closely monitored to ensure that the ASHPs work as they ought to, or require adjustments to settings, and to ensure that the users are comfortable interacting with the controls.

Intervention Reference	9
Action Summary	9.1 Survey properties for wet heating installation requirements 9.2 Install ASHP
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing solid fuel (coal) heating systems with ASHPs can reduce carbon footprint and heat costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers DNO
Property numbers	Ayr- 6 , Carrick- 55, Girvan- 1, Kyle- 22, Maybole- 0, Prestwick- 1, Troon- 1.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	Works should be inspected on completion. Performance across the year in the first completed projects should be closely monitored to ensure that the ASHPs work as they ought to, or require adjustments to settings, and to ensure that the users are comfortable interacting with the controls.

Intervention Reference	10
Action Summary	10.1 Survey properties for wet heating installation requirements 10.2 Install ASHP
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing biomass heating systems with ASHPs will eventually reduce carbon footprint and may reduce the cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	SAC's tenants Suppliers/ installers DNO
Property numbers	Ayr- 2, Carrick- 4, Girvan- 0, Kyle- 1, Maybole- 0, Prestwick- 0, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	The first priority will be vacant properties during transition between tenants. Next, the properties will be prioritised by data zone SIMD to cover multiple properties in the same locale in order to maximise installation time efficiency.
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	Works should be inspected on completion. Performance across the year in the first completed projects should be closely monitored to ensure that the ASHPs work as they ought to, or require adjustments to settings, and to ensure that the users are comfortable interacting with the controls.

Housing Association Interventions

Intervention Reference	11
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Loft insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	HAs HA tenants Suppliers/ installers
Property numbers	Ayr- 719, Carrick- 207, Girvan- 100, Kyle- 391, Maybole- 127, Prestwick- 194, Troon- 195.
Technical considerations	This is an established technology with several vendors and no supply bottlenecks.
Skills Considerations	This is an established practice with no specific skills requirement
Economic considerations	This is a low-cost investment with a lifespan exceeding that of the building.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	12
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Wall insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	HAs HA tenants Suppliers/ installers
Property numbers	Ayr- 106, Carrick- 26, Girvan- 11, Kyle- 63, Maybole- 4, Prestwick- 22, Troon- 25.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	13
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Double glazing is important in reducing heat loss and hence heat demand and bills.
Action Champion	Who in the Council should lead?
Internal stakeholders	Which departments interested?
External stakeholders	HAs HA tenants Suppliers/ installers
Property numbers	Ayr- 28, Carrick- 1, Girvan- 4, Kyle- 4, Maybole- 1, Prestwick- 1, Troon- 1.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	14
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing electric heating systems with ASHPs can reduce heating electricity consumption by 2 to 3-fold but requires a wet heating system to be installed.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	HAs HA tenants Suppliers/ installers DNO
Property numbers	Ayr- 46, Carrick- 148, Girvan- 13, Kyle- 57, Maybole- 5, Prestwick- 33, Troon- 37.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	15
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing oil or LPG boilers with ASHPs will significantly reduce carbon emissions and cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	HAs HA tenants Suppliers/ installers DNO
Property numbers	Ayr- 4, Carrick- 15, Girvan- 0, Kyle- 23, Maybole- 0, Prestwick- 0, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	16
Action Summary	To be set out in final strategy
LHEES Considerations	1 On gas grid 4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing gas boilers with ASHPs will reduce carbon emissions and switching to electric cooking to disconnect from the gas grid and avoid gas standing charges would reduce energy costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	HAs HA tenants Suppliers/ installers DNO
Property numbers	Ayr- 1,097, Carrick- 0, Girvan- 158, Kyle- 230, Maybole- 100, Prestwick- 174, Troon- 171.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	17
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing solid fuel (coal) heating systems with ASHPs can reduce carbon footprint and heat costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	HAs HA tenants Suppliers/ installers DNO
Property numbers	Ayr- 1, Carrick- 2, Girvan- 0, Kyle- 1, Maybole- 0, Prestwick- 0, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Owner Occupied Interventions

Intervention Reference	18
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Loft insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers
Property numbers	Ayr- 6,648, Carrick- 1,271, Girvan- 832, Kyle- 2,508, Maybole- 599, Prestwick- 2,745, Troon- 2,276.
Technical considerations	This is an established technology with several vendors and no supply bottlenecks.
Skills Considerations	This is an established practice with no specific skills requirement
Economic considerations	This is a low-cost investment with a lifespan exceeding that of the building.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	19
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Wall insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers
Property numbers	Ayr- 6,650, Carrick- 1,578, Girvan- 1,140, Kyle- 1,935, Maybole- 719, Prestwick- 2,709, Troon- 2,501.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	20
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Double glazing is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers
Property numbers	Ayr- 1,022, Carrick- 246, Girvan- 141, Kyle- 259, Maybole- 94, Prestwick- 246, Troon- 246.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	21
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing electric heating systems with ASHPs can reduce heating electricity consumption by 2 to 3-fold but requires a wet heating system to be installed.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers DNO
Property numbers	Ayr- 863, Carrick- 508, Girvan- 171, Kyle- 489, Maybole- 66, Prestwick- 262, Troon- 327.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	22
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing oil or LPG boilers with ASHPs will significantly reduce carbon emissions and cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owner Suppliers/ installers DNO
Property numbers	Ayr- 131, Carrick- 1,738, Girvan- 11, Kyle- 1,496, Maybole- 13, Prestwick- 19, Troon- 25.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	23
Action Summary	To be set out in final strategy
LHEES Considerations	1 On gas grid 4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing gas boilers with ASHPs will reduce carbon emissions and switching to electric cooking to disconnect from the gas grid and avoid gas standing charges would reduce energy costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers DNO
Property numbers	Ayr- 14,826, Carrick- 37, Girvan- 2,008, Kyle- 3,849, Maybole- 1,334, Prestwick- 5,448, Troon- 5,569.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	24
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing solid fuel (coal) heating systems with ASHPs can reduce carbon footprint and heat costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers DNO
Property numbers	Ayr- 21, Carrick- 170, Girvan- 9, Kyle- 78, Maybole- 1, Prestwick- 4, Troon- 7.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	25
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing biomass heating systems with ASHPs will eventually reduce carbon footprint and may reduce the cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Suppliers/ installers DNO
Property numbers	Ayr- 6, Carrick- 82, Girvan- 0, Kyle- 41, Maybole- 4, Prestwick- 3, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Privately Rented Interventions

Intervention Reference	26
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Loft insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers
Property numbers	Ayr- 1,138, Carrick- 368, Girvan- 177, Kyle- 395, Maybole- 82, Prestwick- 392, Troon- 343.
Technical considerations	This is an established technology with several vendors and no supply bottlenecks.
Skills Considerations	This is an established practice with no specific skills requirement
Economic considerations	This is a low-cost investment with a lifespan exceeding that of the building.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	27
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Wall insulation is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers
Property numbers	Ayr- 1,387, Carrick- 478, Girvan- 217, Kyle- 392, Maybole- 144, Prestwick- 432, Troon- 549.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	28
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Double glazing is important in reducing heat loss and hence heat demand and bills.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers
Property numbers	Ayr- 350, Carrick- 106, Girvan- 26, Kyle- 89, Maybole- 22, Prestwick- 37, Troon- 23.
Technical considerations	There are several established technologies with several vendors and no supply bottlenecks.
Skills Considerations	These are established practices with no specific skills requirement
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2
Monitoring and evaluation	

Intervention Reference	29
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing electric heating systems with ASHPs can reduce heating electricity consumption by 2 to 3-fold but requires a wet heating system to be installed.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers DNO
Property numbers	Ayr- 428, Carrick- 117, Girvan- 46, Kyle- 73, Maybole- 38, Prestwick- 83, Troon- 108.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	30
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing oil or LPG boilers with ASHPs will significantly reduce carbon emissions and cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owner Tenants Suppliers/ installers DNO
Property numbers	Ayr- 15, Carrick- 438, Girvan- 1, Kyle- 270, Maybole- 1, Prestwick- 5, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	31
Action Summary	To be set out in final strategy
LHEES Considerations	1 On gas grid 4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing gas boilers with ASHPs will reduce carbon emissions and switching to electric cooking to disconnect from the gas grid and avoid gas standing charges would reduce energy costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers DNO
Property numbers	Ayr- 2,490, Carrick- 2, Girvan- 297, Kyle- 441, Maybole- 195, Prestwick- 676, Troon- 819.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	32
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing solid fuel (coal) heating systems with ASHPs can reduce carbon footprint and heat costs.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers DNO
Property numbers	Ayr- 0, Carrick- 42, Girvan- 1, Kyle- 11, Maybole- 0, Prestwick- 0, Troon- 1.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Intervention Reference	33
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency
Background	Replacing biomass heating systems with ASHPs will eventually reduce carbon footprint and may reduce the cost of heat.
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers DNO
Property numbers	Ayr- 0, Carrick- 55, Girvan- 0, Kyle- 7, Maybole- 0, Prestwick- 0, Troon- 0.
Technical considerations	This is an established technology with several vendors. Each house (or house type) will require a unique design for the installation and various small building works and associated disruption.
Skills Considerations	The ASHP installation requires an installer, certified by the supplier.
Economic considerations	The level of investment, if required, could vary significantly between buildings.
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and Appendix G
Monitoring and evaluation	

Mixed-Tenure Interventions

Intervention Reference	34
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency 6 Mixed-tenure, mixed-use and historic buildings
Background	To be set out in final strategy
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers DNO
Property numbers	
Technical considerations	
Skills Considerations	
Economic considerations	
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and 8.1.4
Monitoring and evaluation	

Interventions in historic buildings

Intervention Reference	35
Action Summary	To be set out in final strategy
LHEES Considerations	4 Poor building energy efficiency 5 Fuel poverty resulting from poor building energy efficiency 6 Mixed-tenure, mixed-use and historic buildings
Background	
Action Champion	To be set out in final strategy
Internal stakeholders	To be set out in final strategy
External stakeholders	Owners Tenants Suppliers/ installers DNO
Property numbers	
Technical considerations	
Skills Considerations	
Economic considerations	
Prioritisation	
External Funding Opportunities	
Internal Funding Allocation	To be set out in final strategy
Links to existing projects	To be set out in final strategy
Time	To be set out in final strategy
Action Plan	To be set out in final strategy
Geospatial	Refer to 8.1.2 and 8.1.4
Monitoring and evaluation	

Appendix J Intervention Costs

Total Domestic Intervention Costs

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

Table 22 shows the breakdown of the capital expenditure required per intervention and the effect this intervention has on reducing energy demand across all the South Ayrshire Council building stock. For reference, the baseline heat demand per year for the domestic buildings in South Ayrshire Council is estimated to be 987,000 MWh. This data helps to identify which measures are the most effective way to reduce heating demand, helping both fuel poverty and heat decarbonisation. Loft insulation upgrade is by far the lowest cost method to reduce heating demands. On the other hand, installing external wall insulation on the outside of buildings that already have cavity or internal wall insulation is deemed as the least cost-effective way to reduce heat demand. However, they may be other reasons for doing less cost-effective measures, such as funding streams being allocated only to specific measures or improving the aesthetics of the building with external wall insulation or window upgrades.

Table 23: Summary of Energy Efficiency Interventions Across all Buildings in South Ayrshire

Fabric Measure	Capital Cost (£m)	Heat Demand Reduction (MWh/y)	Cost Effectiveness (kWh/y/£)	Fuel Savings per Investment Cost (£/£)
Cavity Wall Insulation (CWI)	27.6	40,800	1.48	0.22
Internal Wall Insulation (IWI)	5.0	3,400	0.69	0.11
External Wall Insulation (only wall measure)	78.7	37,800	0.48	0.08
External Wall Insulation (alongside CWI or IWI)	503.2	78,400	0.16	0.02
All wall insulation measures	**614.5**	**160,400**	**0.26**	**0.04**
Loft insulation upgrade from <100mm	4.2	26,300	6.28	1.00
Loft insulation upgrade from 100-250mm	11.0	64,800	5.89	0.53
Loft insulation upgrade from 250-300mm	17.2	90,500	5.25	0.23
All loft insulation measures	**32.4**	**181,700**	**5.60**	**0.43**
All Single to Double Glazing upgrade	**17.1**	**6,600**	**0.39**	**0.06**
Cylinder insulation upgrade from <50mm	10.2	14,500	1.42	0.22
Cylinder insulation upgrade from 50-80mm	3.0	2,000	0.68	0.11
All cylinder insulation measures	**13.2**	**16,600**	**1.26**	**0.19**
All Measures	**677.2**	**365,300**	**0.54**	**0.06**

Table 23 the total investment cost across the area from replacing the current heating systems with heat pumps is shown. The return on investment from the reduction in annual fuel costs compared to the cost of installing the heat pump highlights how cost-effective heat pumps can be at reducing fuel poverty. This is particularly the case for buildings currently heated from direct electric, LPG, or Oil. Although the fuel savings from gas

boilers switching to heat pumps is still as effective as external wall insulation on buildings that have already have cavity or internal wall insulation. Although the cost of solid fuels may be lower than that of heat pumps, the improvement in air quality from switching away from burning coal may be worthwhile for the residents alongside the decarbonisation benefits.

Total costs are estimated using the cost of individual heat pumps, although some of these may be communal heat pump systems. Of the heat pump suitable dwellings around 18,000 are flats, and 1,300 are flats that are smaller than 60m². These small flats are the ones which may benefit the most from communal heat pump systems as they may struggle to have space for hot water cylinders or equivalent thermal storage that is required alongside an individual heat pump. The Home Analytics dataset does not specifically state if properties currently have a hot water cylinder, if this data becomes available it can be used to further filter down the small flats by ones that don't already have a cylinder to highlight the more challenging properties for individual heat pumps.

Table 24: Summary of Heating Systems Changes Across all South Ayrshire

Heating System	Number of Buildings	Heat Pump Suitable	Cost of Heat Pump Installation (£m)	Fuel Savings per Investment Cost (£/£)
Biomass	209	-	-	-
LPG	742	453	3.9	0.10
Main Gas	47,187	36,044	306.4	0.02
No Fuel listed	162	121	1.0	-
Oil	3,836	2,023	17.2	0.12
Solid	436	258	2.2	-0.05
Unknown	530	530	4.5	-
Direct electric	4,538	3,699	31.4	0.21
Heat pump	309	306	-	0.00
All Heating Systems	57,949	43,434	366.6	0.04

Table 24 shows all the fabric measures for the dwellings that are owned by the Council. These are all the measures that South Ayrshire Council have direct influence over. The scale of the investment required to implement all the energy efficiency measures, let alone changing the heating source, is far beyond what is achievable for the Council, emphasising the important of further specific targeting of measures.

Table 25: Summary of Interventions Across Local Authority Owned Buildings

Measure	Capital Cost (£m)	Heat Demand Reduction (MWh/y)
Cavity Wall Insulation (CWI)	5.1	6,100
Internal Wall Insulation (IWI)	1.0	500
External Wall Insulation (only wall measure)	8.8	3,700
External Wall Insulation (alongside CWI or IWI)	72.6	10,500
All wall insulation measures	87.5	**20,900**
Loft insulation upgrade from <100mm	0.6	2,800
Loft insulation upgrade from 100-250mm	1.9	5,200
Loft insulation upgrade from 250-300mm	2.8	3,000
All loft insulation measures	**5.3**	**11,000**
All Single to Double Glazing upgrade	**2.0**	**700**
Cylinder insulation upgrade from <50mm	1.5	2,100
Cylinder insulation upgrade from 50-80mm	0.4	300
All cylinder insulation measures	**2.0**	**2,400**
All Measures	**96.8**	**34,900**

Top Third of Data Zones Intervention Costs

Table 25 shows the interventions for the top third of data zones as ordered by energy efficiency as a driver for fuel poverty, for all domestic buildings in South Ayrshire.

Table 26: Interventions for the Top Third of Data Zones, by Energy Efficiency as a Driver for Fuel Poverty

Measure	Capital Cost (£)	Heat Demand Reduction (kWh/y)
Cavity Wall Insulation (CWI)	7,100,000	10,500,000
Internal Wall Insulation (IWI)	1,800,000	1,300,000
External Wall Insulation (only wall measure)	42,300,000	20,500,000
External Wall Insulation (alongside CWI or IWI)	138,100,000	20,700,000
All wall insulation measures	**189,200,000**	**53,000,000**
Loft insulation upgrade from <100mm	1,700,000	10,500,000
Loft insulation upgrade from 100-250mm	3,300,000	11,900,000
Loft insulation upgrade from 250-300mm	5,400,000	8,300,000
All loft insulation measures	**10,400,000**	**30,700,000**
All Single to Double Glazing upgrade	**6,200,000**	**2,500,000**
Cylinder insulation upgrade from <50mm	3,400,000	4,800,000
Cylinder insulation upgrade from 50-80mm	1,000,000	700,000
All cylinder insulation measures	**4,400,000**	**5,500,000**
All Measures	**210,200,000**	**91,700,000**

Local Authority Properties in the Top Third of Data Zones - Affordable Interventions

The interventions in Table 26 are for LA owned buildings which are located in the top third of data zones by fuel poverty, are now at a value which is more realistic for South Ayrshire Council to be able to have an impact on and in the areas where they should have the largest impact in helping reduce fuel poverty. This is a total of 4,717 properties, out of the 73,000 properties in the area.

As adding external wall insulation into buildings that already have cavity or internal wall insulation is a less cost-effective way of reducing heat demand, it is a lower priority intervention and therefore excluded from the recommendations and the total values. If there are specific funding streams that are only available for EWI, or this brings other non LHEES benefits this intervention may still be implemented.

Table 27: Interventions for the Top Third of Data Zones, by Energy Efficiency as a Driver for Fuel Poverty, for LA-Owned Properties

Measure	Capital Cost (£)	Heat Demand Reduction (kWh/y)
Cavity Wall Insulation (CWI)	£560,000	690,000
Internal Wall Insulation (IWI)	£280,000	180,000
External Wall Insulation (only wall measure (EWI))	£920,000	320,000
All wall insulation measures (excluding EWI alongside CWI or IWI)	**£1,760,000**	**1,190,000**
Loft insulation upgrade from <100mm	£220,000	620,000
Loft insulation upgrade from 100-250mm	£390,000	1,000,000
Loft insulation upgrade from 250-300mm	£1,000,000	1,090,000
All loft insulation measures	**£1,640,000**	**2,700,000**
All Single to Double Glazing upgrade	**£510,000**	**130,000**
Cylinder insulation upgrade from <50mm	£710,000	880,000
Cylinder insulation upgrade from 50-80mm	£240,000	150,000
All cylinder insulation measures	**£940,000**	**1,030,000**
All Measures (excluding EWI alongside CWI or IWI)	**£4,850,000**	**5,060,000**

In addition to the energy efficiency measures, and estimated costs, across the top third of data zones by fuel poverty, Table 27 groups buildings by fuel source.

Table 28: Current Fuel Source in LA-Owned Homes in the Top Third of Data Zones by Fuel Poverty

Main Fuel	Number of Buildings	Heat Pump Suitable	Cost of Heat Pump Installation (£)
Biomass	8	N/A	0
LPG	3	2	17,000
Main Gas	3,238	2946	25,000,000
No Fuel listed	10	9	80,000
Oil	299	233	2,000,000
Solid	75	45	400,000
Unknown	0	0	0
Electricity (direct electric heating)	446	384	3,300,000
Electricity (heat pump)	22	N/A	0
Total	4,101	3,641	30,900,000

As well as the LA properties that South Ayrshire Council can have a direct influence over, there is also funding allocated which can help the LHEES considerations for other tenancy properties. South Ayrshire Council can help to engage with relevant owners and tenants to utilise the following funding. More information is found in this LHEES Strategy about the funding streams.

- Area Based Scheme - Funding for owner occupied or privately rented properties that are Council Tax bands A-C can help with insulation and double-glazing installations in addition to the adoption of renewable technologies.
- Warmer Homes Scotland - Funding for homeowners or private sector tenants, to install wall and loft insulation as well as renewables to bring their home up to tolerable living standards.
- Home Energy Scotland Loan - For homeowners to install glazing and renewable systems.
- Home Energy Scotland Private Rented Sector Landlord Loan – To help private rented sector landlords to install insulation, glazing and renewables.
- ECO3 Home Heating Cost Reduction Obligation – For people who qualify for Warm Home Discount and other means tested eligibility to have wall or windows installed.
- ECO3 Local Authority Flexibility Scheme – For low income and those vulnerable to the cold to have wall or loft insulation or window upgrades.
- Registered Social Landlord Loan – For landlords to install wall insulation or windows.
- Energy Efficiency Business Support – Technical advice, loans, and grants on energy efficiency measures for SME, not for profit organisations and charities.
- Heat Network Fund – A maximum of 50% of the capital cost towards eligible heat networks creation or expansion.

Heat Pumps, the Cost and Carbon Emissions

The cost and emissions of heat is dependent on the quantity of heat demand, the heating system efficiency, and the cost of fuel. These factors can help in reducing fuel poverty and in decarbonisation across South Ayrshire Council. Table 28 shows the cost of fuels used in this analysis, this data is from the UK Government Department for Energy Security and Net Zero 2023 Greenbook.

A simple comparison can be made using the cost of fuel to compare the cost of heat using gas boilers compared to heat pumps. For a gas cost of 0.103 £/kWh, with an 80% boiler efficiency this equates to 0.129 £/kWh of heat. Compared to a flat rate electricity cost of 0.34 £/kWh, as long as a heat pump can operate at a minimum COP of 2.64, then the heat pump will be lower cost to operate. As mentioned, the UK Government has set a requirement for heat pumps to be designed to operate at a COP of greater than 2.8 to be eligible for funding[21], implying that with the current cost of gas and electricity heat pumps should always reduce fuel bills and help reduce fuel poverty compared to gas boilers.

In addition, if switching to heat pumps means a building no longer requires gas, by not requiring gas for cooking or a fireplace, then there will be further benefits by not having to pay a gas standing charge.

For heat pumps to be effective measures they should be achieving a COP of 3 or greater, higher values have been achievable in trials with good practise. The Council need to ensure the role out of heat pumps in our properties comes with a good experience and high operating efficiencies, then importantly this information needs to be disseminated across the area.

Using a COP for heat pumps of 3.0 for the analysis, with this heat pump efficiency, compared to direct electric heating which operates close to 100% efficient, a heat pump should reduce fuel bills by a factor of three. This assumes a flat rate tariff, whereas for tariffs with lower night-time rate this difference will be reduced. Although a heat pump can still utilise low night rates direct electric can be more flexible at using the lower rate. Overall heat pump will be a significant benefit in reducing fuel poverty in homes with direct electric heating, which are likely the homes that currently have the highest cost of heat.

Table 29: Cost of Fuels Used for this Analysis.

Fuel	Cost (£/kWh)
Biomass	0.08
Solid	0.0665
Electricity	0.34 (flat rate)
LPG	0.155
Mains Gas	0.103
Oil	0.155

Table 29 shows the total annual cost and emissions from heating all the buildings in South Ayrshire Council. Heat pumps use a COP of 3, direct electric heating uses an efficiency of 100%, and boilers use an efficiency based on the boiler efficiency from their EPC in the Home Analytics dataset.

Table 30: Annual Cost and Emissions of Heating, in Heat Pump Suitable Properties

	Annual Cost of Heat (£)	Annual Emissions (tCO2e)
Current Scenario	134,300,000	210,000
Current heating system, with all energy efficiency measures, excluding EWI on buildings with CWI or 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
Heat pumps in 2035	-	0

[21] Boiler Upgrade Scheme (BUS) - Installers | Ofgem

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

The results in Table 29 use a flat rate tariff for simplicity of calculations and to allow for a worst-case low level of consumer engagement with the heating system. If users are more engaged or allow intelligent control systems for the heat pumps to interact with the modern array of tariffs available, there can be significant further benefits for the user, including cost savings, associated emissions reduction and reduction in electrical network demand. These dynamic or variable time of use tariffs reward consumers who shift their demand to off-peak times balancing the renewable energy supply and demands. Heat pumps can use these times of low cost and low emissions electricity to charge hot water cylinders, they can also be used to maintain a level of temperature in the building, which also has the benefit of reducing the peak heat demand and allowing further lower flow temperatures.

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

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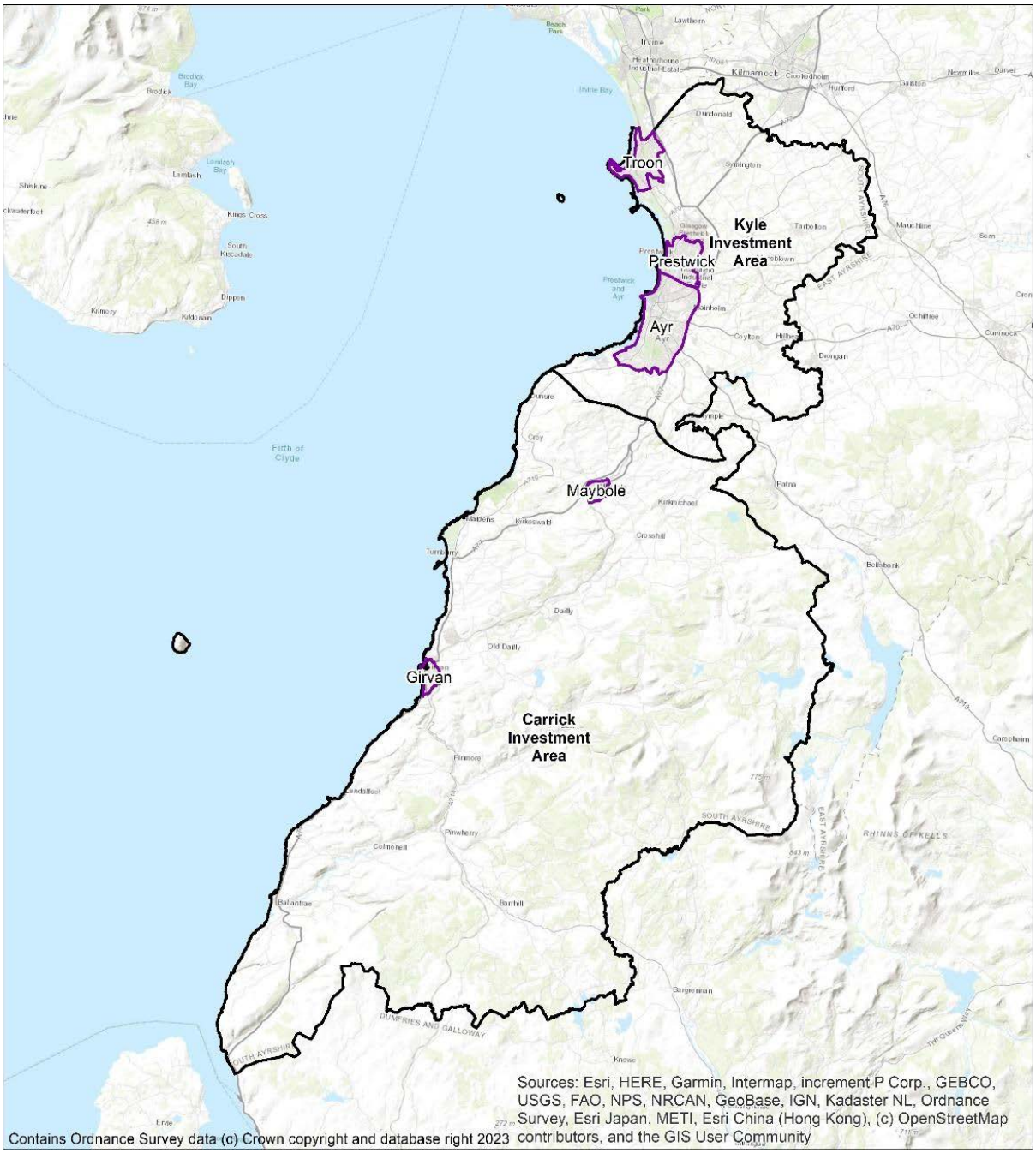
Appendix 2



South Ayrshire Council

Local Heat and Energy Efficiency Strategy

Consultation Draft Strategy

Foreword

As the Portfolio holder for Buildings, Housing, and the Environment in South Ayrshire, it is with great pride that I introduce the Local Heat and Energy Efficiency Strategy (LHEES) for our council area. This strategy marks a pivotal step in our commitment to a sustainable and resilient future, aligning with our aspirations to achieve Net Zero by 2045.

Local authorities across Scotland bear a responsibility for the energy we consume and the emissions this creates, and South Ayrshire is no exception. Through this strategy, we embark on a journey to not only address our local climate challenges but also to contribute meaningfully to the global imperative of mitigating the impacts of the climate emergency.

Our priorities in South Ayrshire focus on our communities, ensuring people can thrive within a flourishing economy, with good quality, energy efficient housing, and an open and transparent, inclusive democracy. This consultation on LHEES lays out our forthcoming initiatives, including the investigation into zero emissions heating systems and heat network potential, reinforcement of our dedication to providing affordable warmth to our most vulnerable citizens, and commitment to partnership working.

In our pursuit of Net Zero, a just transition is paramount. Communities across South Ayrshire are already feeling the effects of climate change, and our commitment is to ensure that they not only endure but prosper throughout this transition. We recognise the importance of co-creating solutions with our communities, placing them at the heart of our endeavours.

Building on our past achievements, including notable reductions in carbon emissions, we acknowledge that resting on our laurels is not an option. This LHEES document will work in tandem with our Ayrshire Energy Masterplan. This pan-Ayrshire initiative is designed to support investment and economic development across the three authorities, in conjunctions with the Ayrshire Growth Deal. By collaborating with our diverse stakeholders, we will turn these strategies into tangible progress, pushing closer to our vision of a Net Zero Carbon South Ayrshire.

I extend an invitation to all residents, businesses, and stakeholders in South Ayrshire to engage with this strategy, offering your thoughts and suggestions. Your input is invaluable as we shape the trajectory of our region towards a sustainable and resilient future.

Contents

1. Overview

1.1 What is an LHEES?

The Local Heat and Energy Efficiency Strategy (LHEES) is a long-term strategic framework designed to support energy efficiency and sustainable heat delivery across all buildings in South Ayrshire. This includes council and privately owned buildings and spans domestic and non-domestic sectors. It serves as a roadmap towards achieving our commitment to Net Zero Carbon, eliminating fuel poverty, and working towards a more environmentally conscious and resilient community.

1.2 Why are we doing this?

As part of the Scottish Governments push for net zero by 2045, it is vital that our homes and buildings no longer contribute to climate change, while tackling fuel poverty within our communities.

Our LHEES will support the objectives within the South Ayrshire Council Plan, Scottish Government targets and objectives, and builds towards Scotland's place in the world.

1.3 What is the focus of this work?

In LHEES, we are looking at area wide approaches, which means focussing on equity, inclusion, and co-creation. Initial work on LHEES will look to build connections with stakeholders from council services and community planning partners, communities and residents, businesses, and the 3rd sector. We are working to build connections with areas of best practice, develop and connect existing areas of work, and form a long-term plan for how we reach our future targets.

In terms of tangible action, this means improving insulation and energy efficiency of all buildings, planning for where area-wide approaches are suitable for heat networks, and identifying what heat provisions are required to meet targets. Throughout this strategy you will find focus sections, these draw out information that will form the basis of delivery plan actions.

1.4 How can you get involved?

Active community engagement is crucial to the success of the LHEES. All stakeholders are encouraged to participate by providing feedback, insights, and suggestions through this consultation.

We need to take an inclusive approach that ensures this strategy is not only well-informed, but reflective of the diverse needs and perspectives within South Ayrshire. Opportunities for involvement will include public consultations, community workshops, and other outreach initiatives.

Questions are set throughout this report and each section links back to the **full technical report**.

[Link to consultation space]

2. Introduction

2.1 Overview of LHEES

The Local Heat and Energy Efficiency Strategies (Scotland) Order 2022[1] places a duty on local authorities to prepare and update a Local Heat and Energy Efficiency Strategy (LHEES) and Delivery Plan. This document is prepared by South Ayrshire Council (SAC) to fulfil its duty under that Order.

This Strategy sets out the long-term plan for decarbonising heat in buildings in the SAC area and improving their energy efficiency.

LHEESs are primarily driven by Scotland's statutory targets for greenhouse gas (GHG) emissions reduction and fuel poverty[2]:

- Net zero emissions by 2045 and 75% reduction by 2030; and
- In 2040, as far as reasonably possible, no household in Scotland is in fuel poverty.

The Strategy should:

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

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

The strategy will be reviewed and updated on a five-year basis, delivery plans will be an active record of projects and will be updated annually.

For strategy scope and limitations, please see appendix A.

[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)

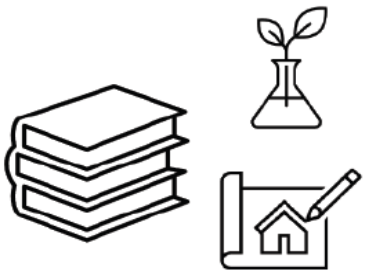
3. South Ayrshire Priorities

Priority One - Community and Sustainability

Supporting those most vulnerable within our communities is a cornerstone of South Ayrshire Council priorities, from our Council Plan to our Local Housing Strategy. Our LHEES will prioritise reduction of fuel poverty, enhancement of our natural environment, and the delivery of an equitable, just transition.

Priority Two - Economy and Opportunity

Delivering energy efficiency and developing low carbon technologies have the potential to support economic development, job creation, and foster closer engagement between stakeholders across South Ayrshire. Our LHEES will support the Ayrshire Energy Masterplan in delivering the benefits of a just transition to all of South Ayrshire.



Priority Three - Education and Skills

Supporting an energy transition is a cross-generation task, so we must look to support the skills available to deliver this now and in the future. We must look at fostering education and innovation in schools, further education, higher education, and within industry apprenticeships. Our LHEES will work to establish links across all age ranges, supporting a skills workforce to put South Ayrshire at the forefront of the move to Net Zero.

Throughout this document you will find challenge and focus sections, intended to highlight the key considerations, and build to form delivery plan actions. These will reference these priorities.

Consultation Question 1

Do you think the priorities identified in Section 3 are in the best interest of the people of South Ayrshire?

4. Background Information

4.1 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 aims and the accompanying Delivery Plan sets out actions to support implementation of this Strategy.

4.2 LHEES Considerations

The LHEES guidance sets out the key considerations for this Strategy, shown in Table 1. These help to categorise building stock into groups that require similar interventions.

Table 1: LHEES Considerations

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

This LHEES has been developed in line with the Scottish Government methodology, with some adjustments to suit the specific context of the authority. For detail on the LHEES approach and methodology, please refer to Appendix A.

In this initial LHEES, South Ayrshire is focussing on:

- Improving energy efficiency and reducing fuel poverty,
- Transitioning off gas buildings to low carbon heating,
- Buildings feasibility for heat networks where appropriate.

Consultation Question 2

Do you think the considerations in focus from Section 4 are appropriate and connect with the overall LHEES priorities?

4.3 Interventions

There are a range of potential interventions, from energy efficiency measures to low and zero carbon heating systems, which will play a role in South Ayrshire's LHEES. Table 2 summarises these technologies and developed routes.

The Scottish Governments Heat in Buildings Strategy[3] (HIBS) states that for the period to 2030, focus must be on accelerating the deployment of tried and tested measures where they are known to be no or low regrets.

As noted, South Ayrshire's focus with regard to technologies for this initial LHEES will look at improving energy efficiency, transitioning off gas buildings to low carbon heating, and building feasibility for heat networks.

Table 2: Heat decarbonisation routes

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
Energy efficiency	Measures such as double glazing, draught proofing and insulation reduce energy demand which in turn increases the viability for switching to low carbon heat sources	Improved energy efficiency leads to reduced energy costs, which reduces fuel poverty. Grants and loans are available for lower income households.	Where feasible and cost-effective, the Scottish Government 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, ground, water or wastewater. Grid electricity is continuing a trend of decarbonisation through renewable energy.	Appropriately designed and well-running heat pumps can reduce costs, particularly compared to electric heating. Savings are dependent upon the relative price of electricity compared to the fuel displaced as well as the coefficient of performance (COP) of the installation. Replacing electric heating with a heat pump can reduce energy consumption and reduce fuel poverty.	Heat pumps are commonly used in cold climate, such as Scandinavia and research has found that all UK house types are suitable for heat pumps[4]. Where necessary, upgrades to heat emitters or hot water storage can present practical challenges in some properties. The electricity network will need to accommodate increase in electricity demand from heat pumps, direct electrical heating, and other energy sources such as Electric Vehicles. Hot water production is usually provided through a hot water cylinder, which requires space in a property.
Heat networks	Heat networks, which use waste heat, heat pumps or bioenergy as their energy source	The Competition and Markets Authority found that up to 90 % of heat network customers enjoy similar, or lower, bills than those with standard gas boilers and heat networks can cut both emissions and bills.	Heat networks are suitable for all building types but only in areas with a sufficient density of heat demand

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

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

Intervention	Heat decarbonisation	Effect on fuel poverty	Suitability
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, the high cost of electricity must be considered for households at risk of entering fuel poverty. Storage heaters can be used to harness cheaper electricity at night but can emit and waste heat when not required	Electric heating is suitable for all properties with a suitable electricity connection. Hot water production is usually provided through a hot water cylinder, which requires space in a property.
Bioenergy	Sustainably sourced, bioenergy (i.e., solid biomass, biogas or biomethane) is regarded as carbon neutral	There is uncertainty surrounding the future supply of bioenergy and biomass boilers tend to have more maintenance requirements than gas boilers	HIBS indicates that bioenergy is likely to have a limited role in the decarbonisation of the building stock. There may be some buildings for which bioenergy can play a role, for example in hard to treat off-gas properties where heat pumps are unsuitable. However, the UK's Green Gas Support Scheme aims to increase the proportion of biomethane in the gas grid. A bioenergy Action Plan is due to be published in late 2023. Air quality concerns need to be considered in urban settings
Hydrogen	Green hydrogen is produced by splitting water using renewable electricity while blue hydrogen is produced from fossil fuels plus carbon capture. Therefore, both production routes are deemed as low carbon in UK and Scottish legislation. Increased availability of hydrogen for heat will have positive implications for the suitability of hybrid heat pump systems, which may be cost-effective solutions	Currently hydrogen is an underdeveloped fuel and is associated with high costs. The future of hydrogen prices is uncertain but may become competitive with other energy sources in the coming decades. However, without Government incentives prices for green hydrogen are unlikely to be lower cost than using direct electrical heating or heat pumps as hydrogen system efficiency is lower than using electrified heating.	Hydrogen is not currently available for supply of heat to domestic properties and is not seen as an immediate solution[5].

[5] Delivering Net Zero for Scotland's Buildings - A Consultation on proposals for a Heat in Buildings Bill (www.gov.scot)

5. Policy and Strategy Context

5.1 National Strategic Context

On a UK level, there exists legally-binding legislation to reach net zero emissions by 2050. The Net Zero Strategy: Build Back Greener[6] report denotes than one third of emissions are a result of heating for homes and workplaces. The UK Government is responsible for regulation of the electricity and gas networks and markets. Other targets are set, such as reaching 600,000 heat pump installations nationwide by 2028[7].

The Scottish Government has more ambitious targets than the UK, with net zero by 2045 and 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 energy and energy efficiency, while many aspects of energy policy are reserved by the UK Government. Chapter 10 of the Heat in Buildings Strategy[8] (HIBS) discusses the need for the UK and Scottish Government to work alongside each other to facilitate the decarbonisation of heat.

The Tackling Fuel Poverty in Scotland: A Strategic Approach[9] sets the target to maximise the number of fuel poor households attaining EPC B by 2040. At the time of writing, the Scottish Government are consulting on an EPC reform, which likely will have an impact on the grading of the building stock and the effect of measures[10]. 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, 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 EPC 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.

A detailed outline of this and other Scottish policy drivers and contexts can be seen in Appendix B.

5.2 Local Policy and Strategy Context

LHEES is not a strategy on its own. Policies and strategies across the council are designed to be interoperable with each other, supporting and developing the principles within the Council Plan. In this way, table 3 shows a sample of the links to and from LHEES within other council strategies, plans and policies.

[6] Net Zero Strategy: Build Back Greener - GOV.UK (www.gov.uk)
[7] Heat Pump Investment Roadmap (publishing.service.gov.uk)
[8] Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings - gov.scot (www.gov.scot)
[9] Tackling fuel poverty in Scotland: a strategic approach - gov.scot (www.gov.scot)
[10] Energy Performance Certificates - Energy efficiency - gov.scot (www.gov.scot)

Table 3: Local Policies and Strategies

Strategy, Policy, Plan	Description	Linkages
Statutory Development Plan	The statutory development plan comprises both Scottish Governments National Planning Framework (NPF4) and South Ayrshire Council's Local Development Plan (LDP2). The LDP2 is a spatial land use document which guides the future use of land in our cities, towns, and rural areas. It considers and addresses land use issues arising from the implications of economic, social, and environmental change. In doing so, this document provides an overall, joined up approach to managing development that can set out ambitious but realistic long-term visions the South Ayrshire Council area. This plan forms the prime consideration in the determination of planning applications.	**LDP Linkages:** **Core themes C - Our Environmental Responsibilities** How we will be mindful of our responsibilities for the protection of our natural, built, and cultural heritage resources. Core Principles: C1 – We will promote the sustainable use of natural, built, and cultural heritage resources. Strategic Policy 1: Sustainable Development - We will support the principles of sustainable development by making sure that development meets the following standards: o Designed to maximise energy efficiency through building siting, orientation, and materials, o Helps mitigate and adapt to the effects of climate change. o Includes the use of micro-renewables, wherever appropriate o Wherever possible, Incorporates or facilitates the development of District heating / heat networks. For reference: Low and zero-carbon buildings (pg. 82) LDP policy: renewable energy (pg. 82) LDP policy: heat networks (pg. 84)
Local Housing Strategy	The LHS is a 5-year plan to support people of South Ayrshire to find good quality housing, develop a sense of identity and belonging, reduce homelessness, and support all residents in their ability to live in a warm, dry, energy efficient home that meets their needs.	**Cross-cutting themes** – Sustainability, climate change and biodiversity Agreed Principle: Healthy Homes and Fuel Poverty Outcomes: HH1, HH2, HH3, HH5
Strategic Housing Investment	The Strategic Housing Investment Plan (SHIP) 2023/24 – 2027/28 sets out the strategic investment	**Strategic priority – Sustainable Communities and Sustainable Developments** All projects proposed in the SHIP will help to tackle fuel poverty and ensure that heat is affordable for residents

Strategy, Policy, Plan	Description	Linkages
Plan 2023/24 – 2027/28	priorities for affordable housing over the next five years that will achieve outcomes set out in the Local Housing Strategy and HNDA.	by increasing energy efficiency and reducing the amount of energy required to heat the home.
Sustainable Development and Climate Change Strategy 2019 – 24	This strategy sets out a coherent framework for the council projects, policies and initiatives which promote sustainable development, mitigate climate changing emissions, and adapt to the impacts of climate change. It focuses on the themes of sustainable council, environment, and community with broad outcomes and actions for each.	**Outcome 1** - reducing emissions from energy use, improving economic development opportunities, and embedding mitigation, adaptation, and partnership working. **Outcome 3** - links through energy activities within local communities.

6. Challenges and Opportunities

The scale of the change involved in decarbonising heat in South Ayrshire should not be understated. Energy transitions present huge challenges economically and socially; however, they do present opportunities as well.

Opportunities

6.1 Just Energy Transition

The concept of Just Transition originated in the 1980's and has gained traction in terms of sustainable development and energy transition. The International Labour Organisation (ILO) defines it as "Greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities and leaving no one behind."

This is a principle we seek to embed in the LHEES, improving equity and reducing inequality.

Every Scottish Local Authority must undertake an LHEES, and each will assess the level of interventions required to work towards heat decarbonisation. Combined with legislative drivers this transition to decarbonise heat in buildings has significant implications for supply chain development, reskilling and upskilling, and knowledge transfer.

Recent research has shown that improved energy efficiency was responsible for almost 25% of all GDP growth in the UK since the 1970's[11], and that early planning and embedding of social equality can significantly improve outcomes[12]. In this way, ensuring a just energy transition in South Ayrshire not only supports the local economy to be at the forefront of this national change, but ensures that we are delivering on our commitment to protect those most vulnerable in our communities.

[11] https://ukerc.ac.uk/news/energy-efficiency-contributed-25-of-uk-economic-growth-since-1971/

[12] https://www.gov.scot/publications/transitions-comparative-perspective/pages/5/

6.2 Ayrshire Energy Masterplan

The Ayrshire Energy Masterplan represents a cross-authority approach to develop a strategic energy vision for the Ayrshire region. This will include socio- and techno-economic modelling to identify investment opportunities, areas of business growth, and skills and supply chain development areas. Strategic outcomes will link with LHEES through local energy and heat generation, decarbonisation, investment in local carbon technologies, and a just and inclusive energy transition.

The strategy is due to be released in early 2024 and will link closely with the LHEES delivery planning.

6.3 Engagement & Development

Although LHEES is developed by South Ayrshire Council, this strategy is relevant to all stakeholders in South Ayrshire. To deliver on our commitments, we will need to build and develop engagement routes across services, sectors, and communities.

Consultation on this document will be sought through our community planning partners, registered social landlords, economic development groups, third sector organisations, community groups and members of the public. Through this we look to forge new partnerships and identify new opportunities for collaboration and investment.

6.4 Community Wealth Building

Community wealth building is a people-centred approach to local economic development, which redirects wealth back into the local economy and the surrounding community. It can deliver more business growth, community owned assets, and improved resilience while building social and environmental justice. This can be done through local anchor organisations such as local councils, community groups, housing associations, or education facilities.

In the Wallacetown Community Energy Project Proposal, the local community association is working in partnership with South Ayrshire Council, seeking to install community owned PV panels onto the roofs of three school buildings in the Wallacetown neighbourhood of Ayr. The Council will purchase the power generated by the panels for use in the school buildings, with the surplus sold to the National Grid. The income earned, after costs, will go to create a new 'Wallacetown Benefit Fund' managed by the community, that will fund future education and wellbeing projects.

Focus

- ***Priority 1*:** Embed the principles of Just Transition into LHEES development and delivery,
- ***Priority 2*:** Support the Ayrshire Energy Masterplan project to broaden commercial engagement,
- ***Priority 2*:** Establish LHEES within existing consultation routes, and develop new routes where possible
- ***Priority 1 & 2*:** Support the development of the Wallacetown Community Energy Project

Challenges

The challenge of decarbonising heat on an area wide basis is a massive challenge, which this iteration of LHEES seeks to take the first step towards.

One of the main challenges in decarbonising heat in South Ayrshire is the age and energy efficiency of buildings across the authority.

All LHEES work across Scotland is based on the Home Analytics and Non-domestic Analytics datasets, which is managed by Home Energy Scotland on behalf of the Scottish Government. This data set gives property level information about property type, age of construction, EPC, and energy efficiency measures installed.

6.5 Domestic Buildings

For South Ayrshire records show:

- 57,949 domestic properties in South Ayrshire,
- 8,567 owned by South Ayrshire Council (14%),
- 2,330 owned by housing associations (4%),
- 6,697 owned by private landlords (11%),
- and 39,713 being owner-occupied (68%).

Note: 642 addresses lacked detail and were removed from analysis

There are conservation areas in South Ayrshire and 4,636 domestic properties are situated in those. Listed buildings make up 2 % of the domestic building stock, with South Ayrshire Council owning 26.

The majority of the domestic building stock in South Ayrshire was constructed after 1950 (Figure 2) with 87 % of SAC's stock built before 1983. Housing association stock has a larger proportion of newer builds, reflected in a high percentage of properties reaching an EPC grade of C or better.

As the LHEES seeks to support decarbonisation of not only buildings we own and manage, but domestic and commercial properties as well, there is an extensive amount of engagement required to inform and support building owners in this journey. Much of this engagement takes place already, through several different routes including tenant participation, registered social landlords, private landlord communications, economic development teams, and community support groups. A main challenge of this LHEES will be coordination of messages across these groups, linking with their priorities and objectives in order to deliver on actions.

Challenges

- Higher than Scottish average owner-occupier (58%) and lower than average socially rented (23%) means less direct action available to SAC,
- Higher than average pre-1919 building stock (18%),
- Greater levels of heat demand in private rental and owner occupier properties

Focus

- ***Priority 1:*** Exemplify *e*xisting best practice work in SAC towards national standard,
- ***Priority 1:*** Support and inform ongoing energy efficiency programmes,
- ***Priority 2:*** Extend engagement with SAC departments, owner-occupiers, Registered social landlords, private rental landlords, and communities.

Figure 1: Domestic heating energy demand

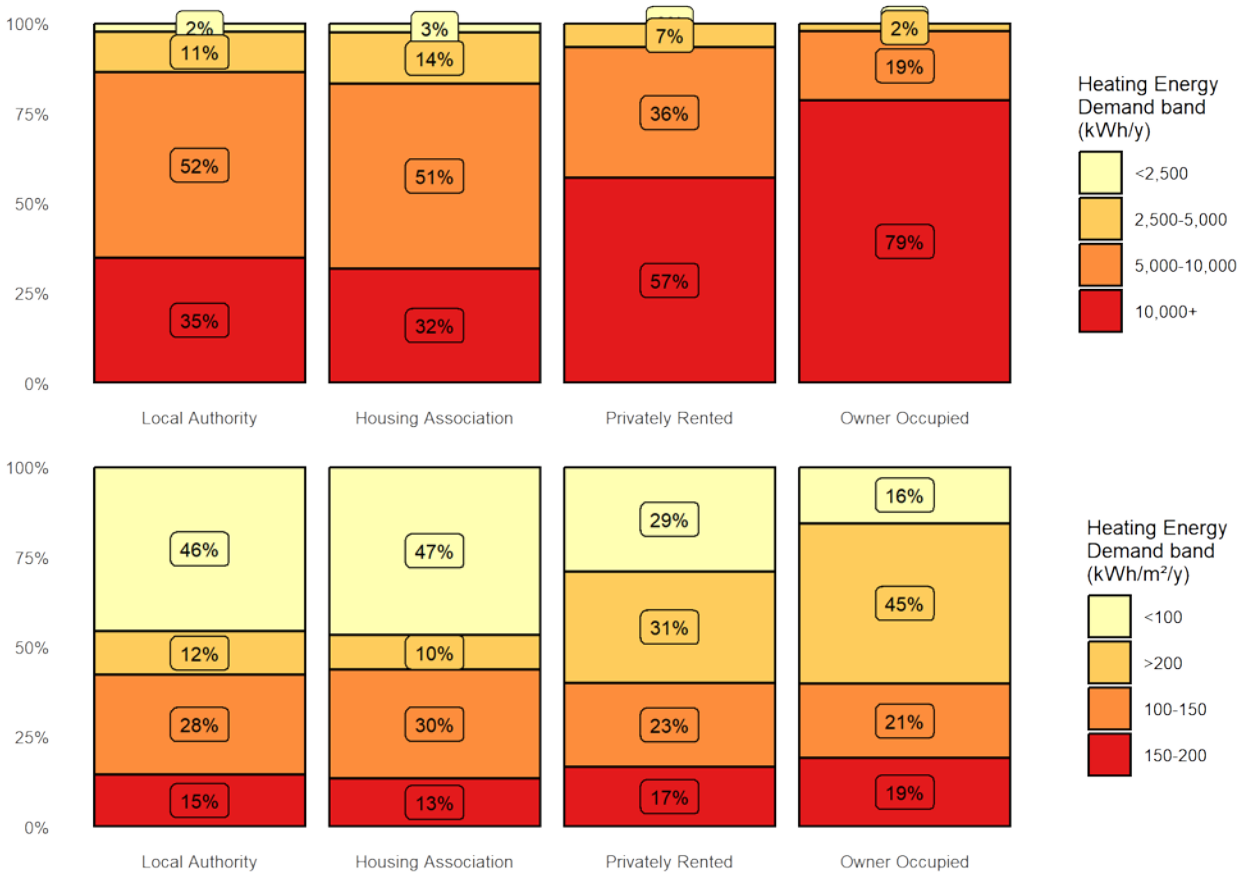
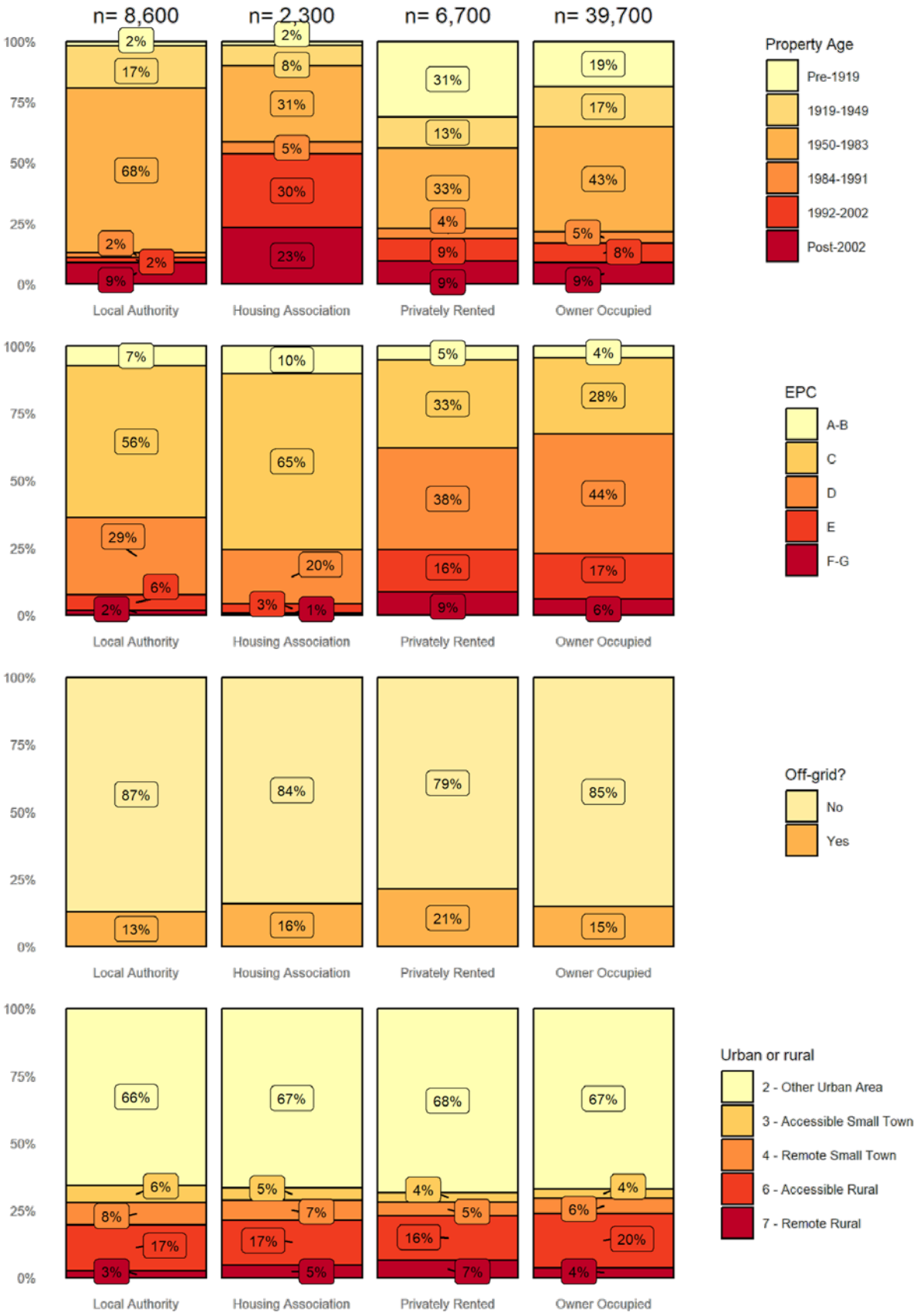


Figure 2: Domestic buildings- Distributions of age, EPC rating and gas grid connectivity by tenure type



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

6.6 Non-domestic Buildings

The Non-Domestic Baseline Tool utilises data derived from Non-Domestic Analytics data sets. This analysis is based on the best available data, but there are gaps in reliability and coverage. Nevertheless, the data has been used for the baselining step of the LHEES process to get a flavour of the building stock.

This data will be supported through the Ayrshire Energy Masterplan (AEM); an ongoing project across the three Ayrshire's which looks to identify investment and development opportunities in heat and energy decarbonisation. The introduction of Building Assessment Reports (BAR) from Scottish Government will further develop this picture in the near future.

The Non-Domestic Baseline Tool records 4,135 non-domestic buildings in South Ayrshire. Together, these have an estimated total heat demand of 150,000 MWh/y. An analysis of these properties can be seen in figure 3 below.

Gas is the biggest source of heat but electricity is close behind and, along with oil, they have the largest share of small heat loads. Smaller buildings account for almost half of the total heat demand and supporting those with small oil systems, which would not individually be as expensive, for heat pump or heat network connection could be a priority. It is likely that the small properties utilising electricity are already using heat pumps for heating and cooling.

A large proportion of buildings are pre-1919 with a high heat demand and this group of properties may be a target for energy efficiency measures. The data lists 55 % of these pre-1919 buildings as being retail or financial and 79 % as being in towns, making up most high street retailers.

Generally, non-domestic heating energy demand is dominated by the retail and finance sector *(Figure 3)*.

Challenges

- Data availability and reliability,
- Varied challenges with heat demand depending on business type,
- Traditional build high streets with hard-to-treat properties.

Focus

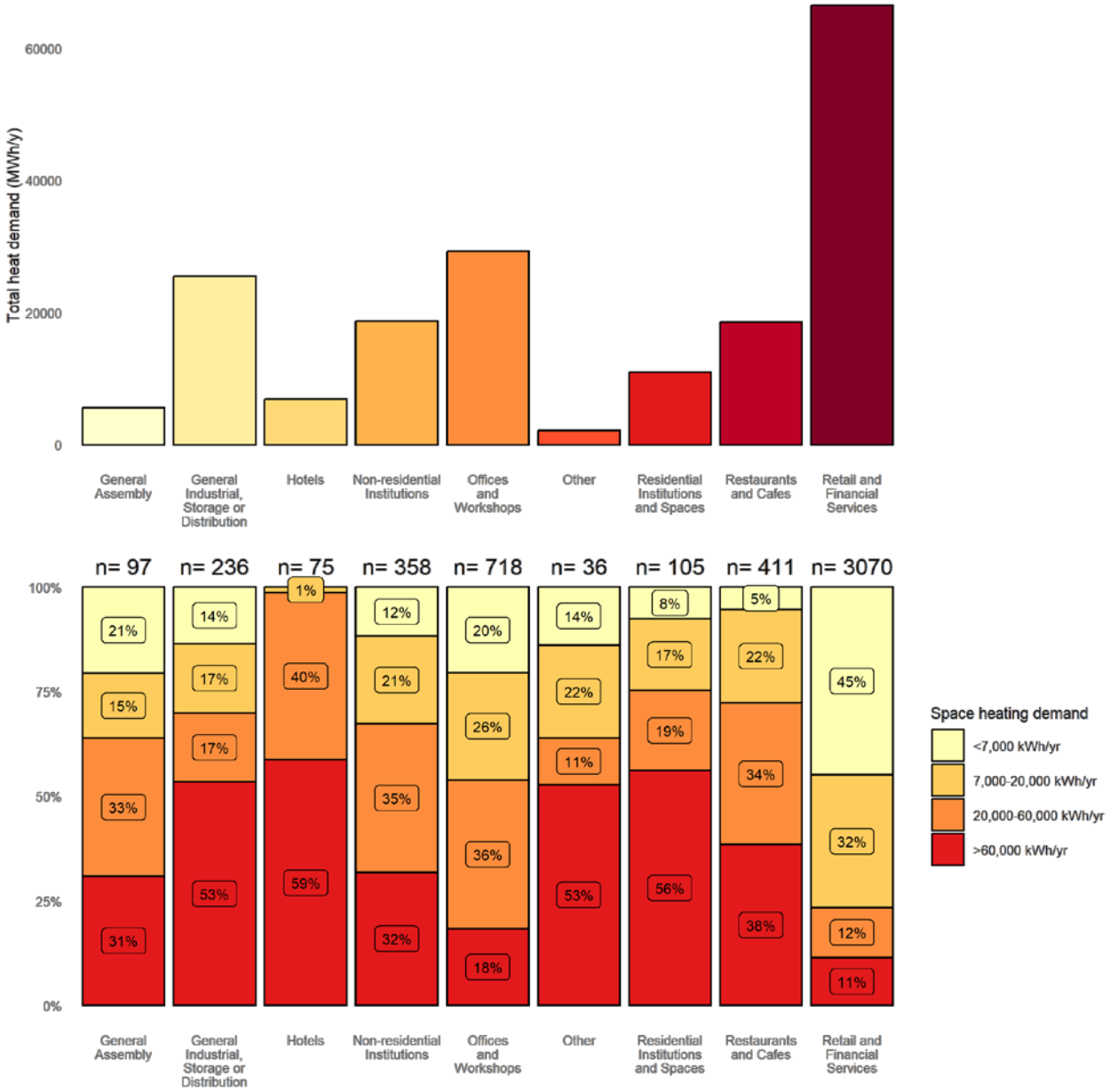
- ***Priority 2:*** Existing work through AEM to support engagement with non-domestic owners,
- ***Priority 2:*** Support Building Assessment Report process and integrate data,
- ***Priority 2 & 3:*** Explore co-working opportunities with Economic Development and community planning partners

Consultation Question 3

Do you agree with the challenges and opportunities outlined in Section 6?

Do the areas of focus in Section 6 reflect a suitable first step for domestic and non-domestic decarbonisation?

Figure 3: Non-domestic building type by heat demand



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

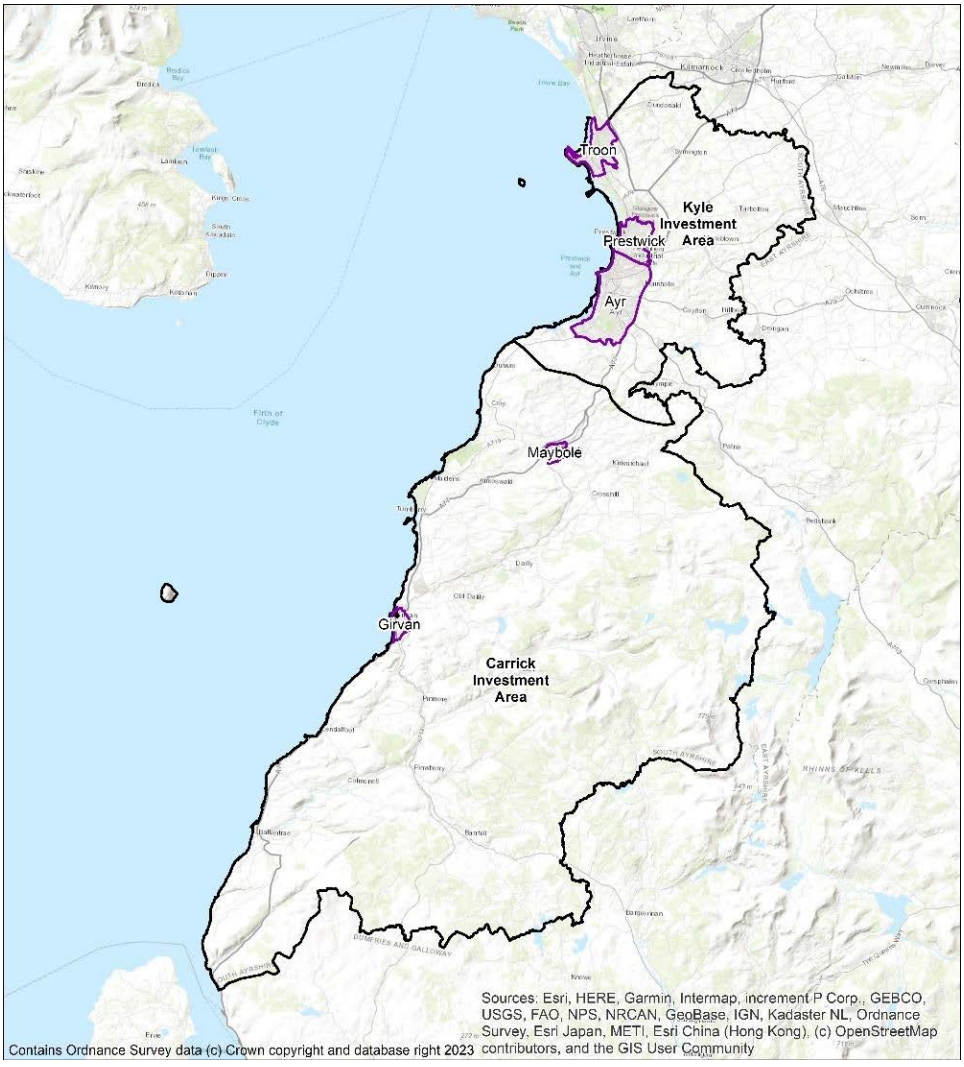
7. Strategic Zones and Baseline

This section illustrates how we have set out Strategic Zones and developed pathways for each. In this section the approach to selecting Strategic Zones is described, as well as the attributes for each which affect the strategic options. Weighted scores are used to assess energy efficiency and factors affecting the development pathways. A higher score is representative of poorer energy efficiency. Full details on the weighting and calculations are available in the **full technical report** in A*ppendix C, D and I*.

7.1 Local Development Plan Areas as LHEES Strategic Zones

Through our LHEES work, "intermediate" geographical zones have been generated to show priority areas to target interventions, the analysis and indicators used can be seen in the **full technical report**, *Appendix A, and I*. In addition to this standard methodology, data was mapped against SACs Local Development Planning boundaries, as shown in figure 4.

Figure 4: South Ayrshire's Strategic Zones



Creating a baseline of information about our building stock in South Ayrshire gives both a starting point to approach the task of decarbonisation, and a reference to measure our progress against in future.

7.2 Domestic Properties and Tenure

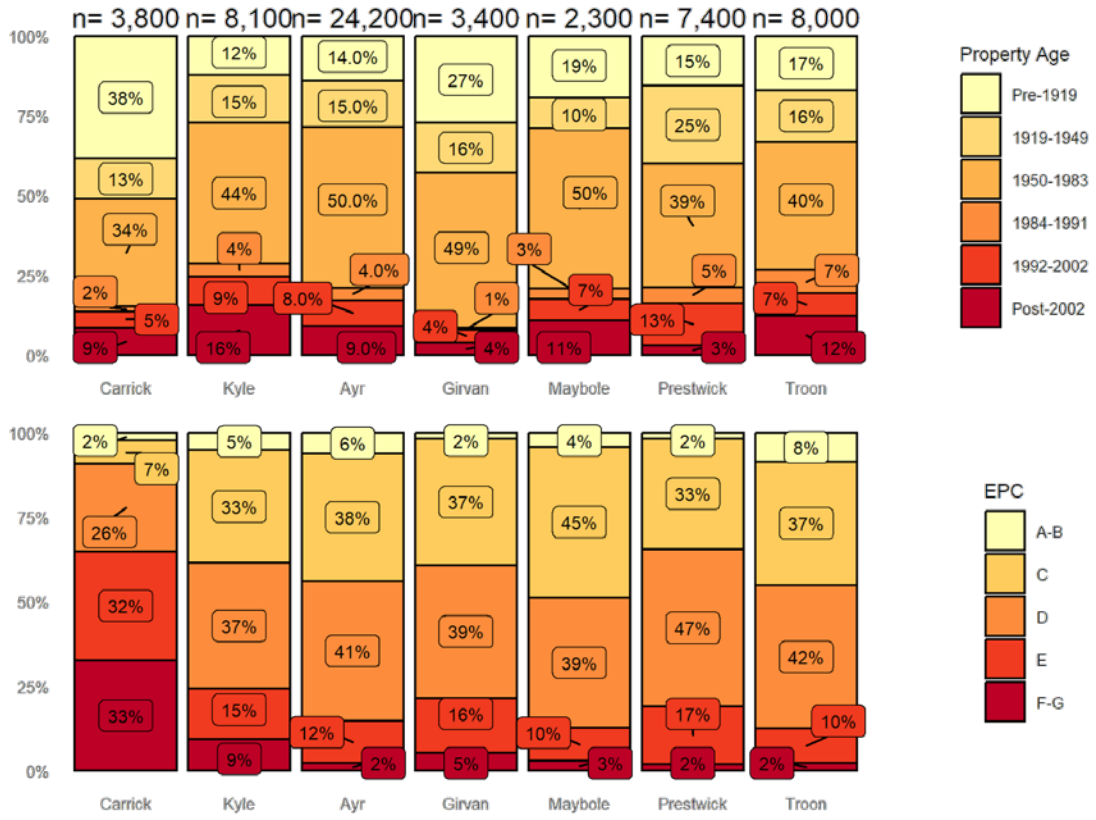
The numbers of domestic properties in the Home Analytics dataset, broken down by Zone and tenure are given in Table 4.

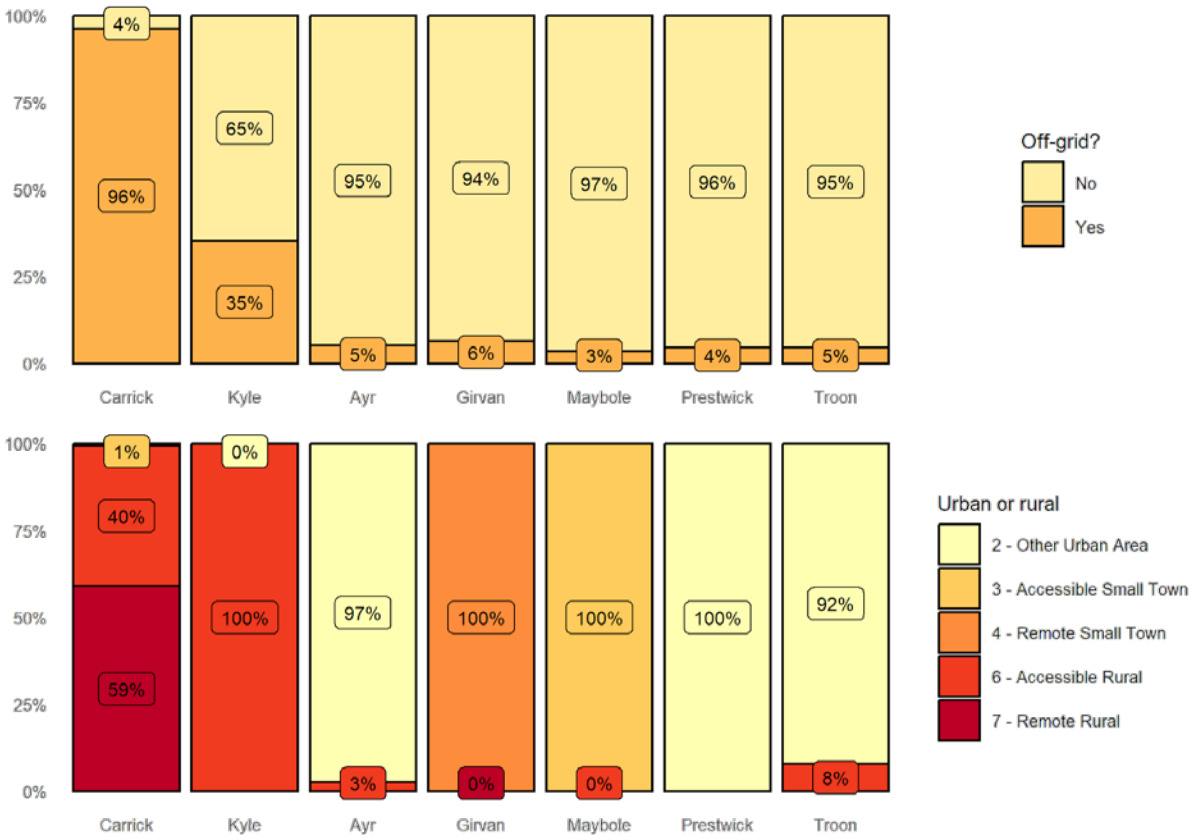
Table 4: Domestic properties in the Strategic Zones

Zone	Total domestic properties	Tenure				Mixed tenure in parent building
		SAC	Housing Association	Private Rental	Owner Occupied	
Carrick	3,800	470	170	660	2,500	214
Kyle	8,100	1,050	320	800	5,930	409
Ayr	24,200	4,210	1,150	2,940	15,900	5,232
Girvan	3,400	700	170	330	2,200	414
Maybole	2,300	520	110	240	1,450	311
Prestwick	7,400	680	210	770	5,740	908
Troon	8,000	930	210	940	5,920	1,647

A baseline assessment of these properties by area, age, EPC, gas grid connection and urban or rural designation is shown in Figure 5.

Figure 5: Baselining of domestic properties in the Strategic Zones





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

7.3 Domestic Energy Efficiency

In order to improve energy efficiency in domestic buildings, a wide range of improvements have to be considered. This work is already underway, in line with council priorities and programs such as Home Energy Efficiency Programmes for Scotland: Area Based Schemes (HEEPS:ABS). This LHEES will seek to support and expand both funding and delivery as required to meet objectives.

Table 5 shows interventions required for each strategic zone and their weighted score with mapping shown in figure 6.

Table 5: Domestic energy efficiency weighted scores by strategic zone

Strategic Zone	Number of interventions required				Percentage of housing stock				Total Weighted Score
	Loft Ins.	Glazing Upgrade	Wall Ins.	All	Loft Ins.	Glazing Upgrade	Wall Ins.	All	
Carrick	819	373	2,159	3,351	21 %	10 %	56 %	87 %	29
Kyle	801	375	2,500	3,676	10 %	5 %	31 %	45 %	15
Ayr	2,147	1,488	8,552	12,187	9 %	6 %	35 %	50 %	17
Girvan	497	191	1,418	2,106	14 %	6 %	41 %	61 %	20
Maybole	250	133	954	1,337	11 %	6 %	42 %	58 %	20
Prestwick	955	310	3,278	4,543	13 %	4 %	44 %	61 %	20
Troon	709	290	3,225	4,224	9 %	4 %	40 %	53 %	18
Total	6,178	3,160	54,180	14,386					

The three groups of interventions are broken down by strategic zone and tenure are shown in Figure 6. Much of the Home Analytics data is implied from other observations (e.g. wall construction) where there is no direct observation of a feature (e.g. wall insulation). A target for this LHEES is to improve the quality of the data used for decision-making and this can be done in tandem with the Scottish Government to improve the Home Analytics dataset.

This analysis gives several broad considerations for this and future LHEES work:

Wall insulation

Wall insulation is the largest required intervention area with an average of 41% of properties requiring some level of improvement. While there is a proportion of homes with solid walls which are hard to insulate, the most common construction type in every strategic zone is cavity walls which should not hinder improved insulation (Figure 6).

Loft insultation

There should be limited barriers to installing loft insulation to owner occupied and privately rented homes, since it is both cheap and usually easy to install.

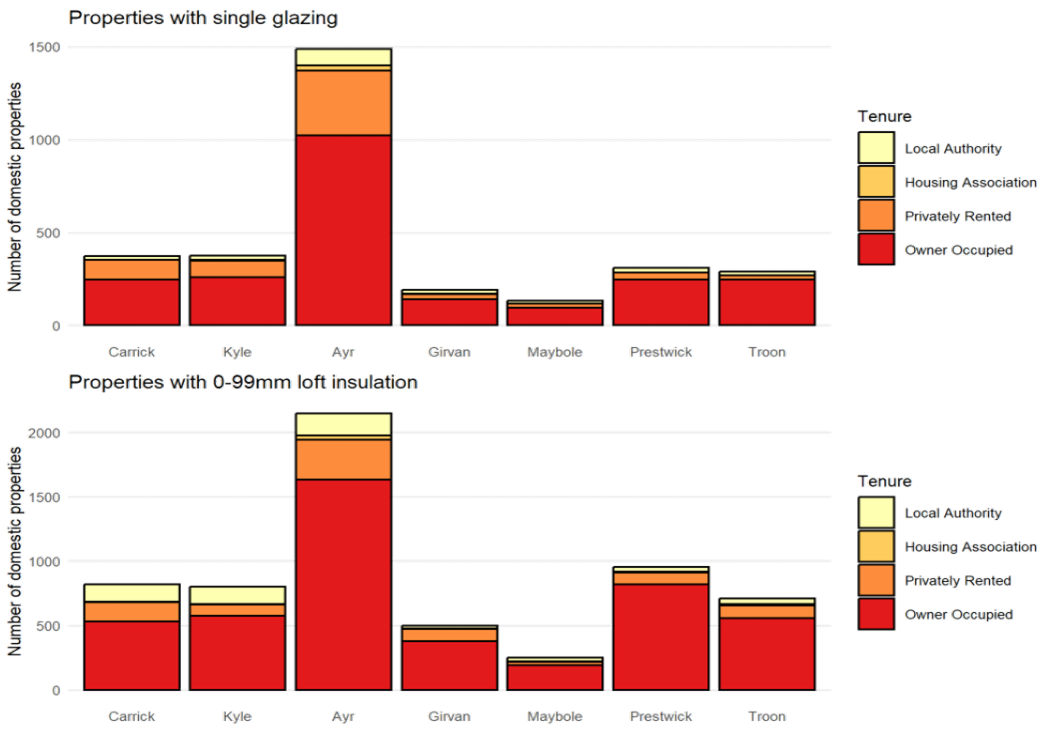
Private Sector

Figure 7 shows the private sector is key for targeting support for improvements. Also in the private sector, 1,069 homes with single glazing are either listed or sit in conservation areas and, consequently, barriers to interventions may be more than just financial.

Carrick

Carrick stands out with respect to the weighted scores, with the highest percentage of interventions required in each category.

Figure 6: Domestic properties requiring upgrades to glazing, and loft and wall insulation



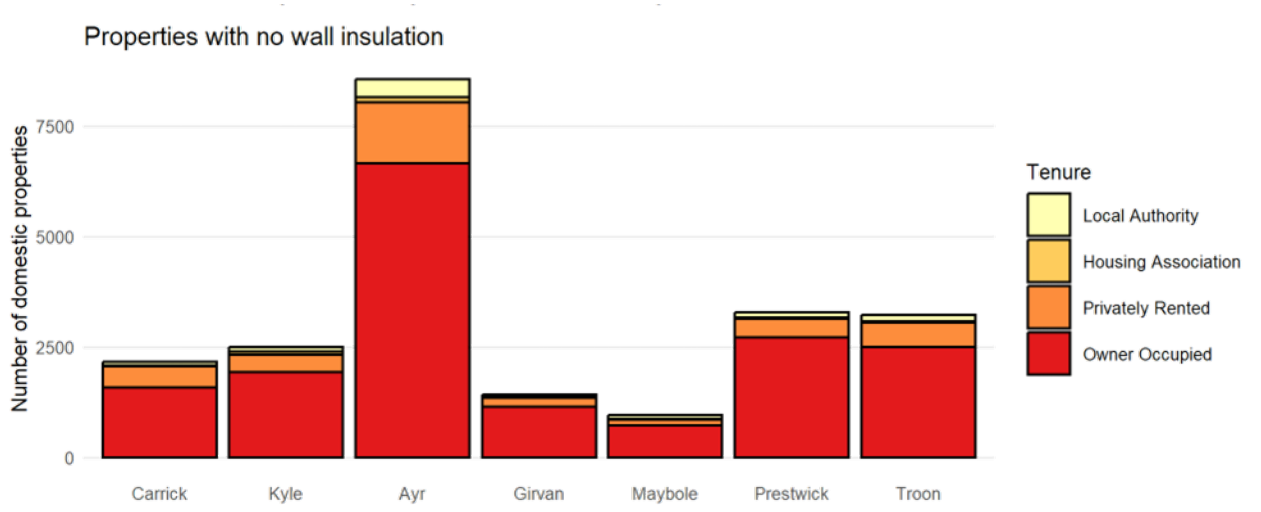


Figure 7: Wall construction in privately rented and owner-occupied houses

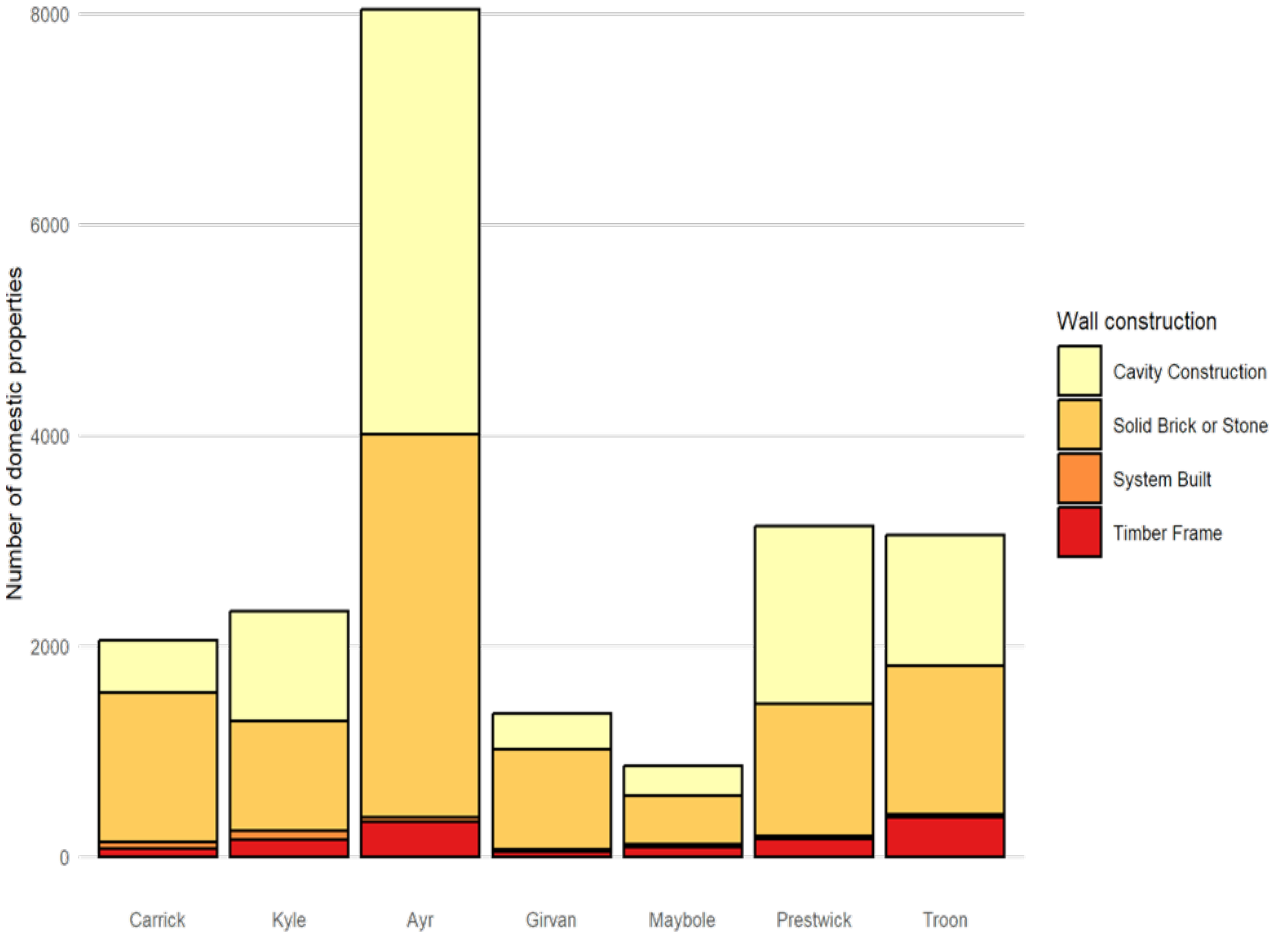
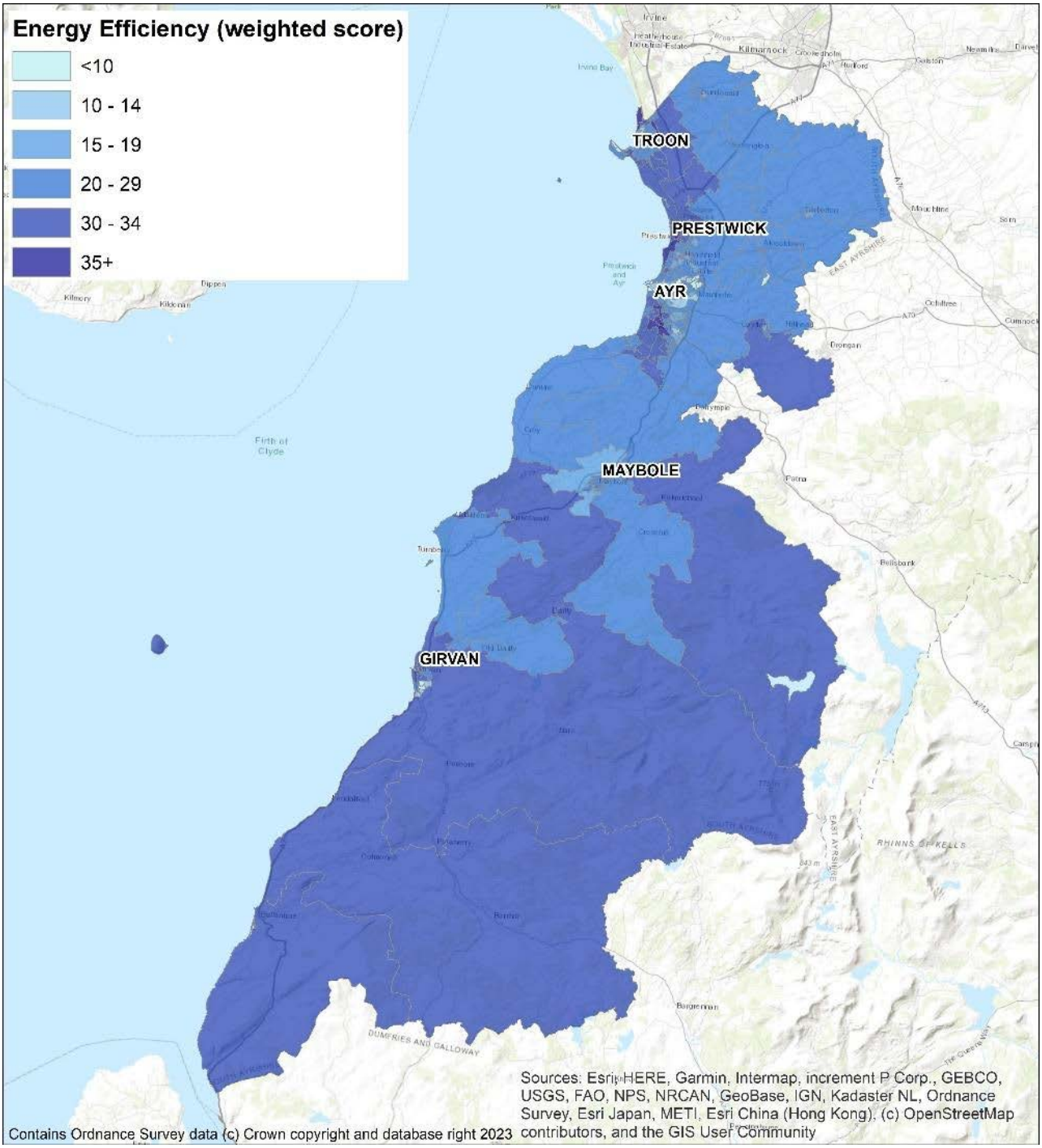


Figure 8: Map of Weighted Energy Efficiency Score – Data Zone Level



The baseline heat demand per year for the domestic buildings in South Ayrshire Council is 835,000,000 kWh. Table 6 shows the potential effect energy efficiency interventions can have on reducing demand across all the South Ayrshire building stock. This helps identify which measures are most cost effective, helping both fuel poverty and heat decarbonisation. Loft insulation upgrades is by far the lowest cost method to reduce heating demands. On the other hand, installing external wall insulation on the outside of buildings that already have cavity or internal wall insulation is deemed as the least cost-effective way to reduce heat

demand. However, other factors such as available funding streams or improving the aesthetics of the building with external wall insulation or window upgrades can drive lower efficiency improvements.

Table 6: Summary of energy efficiency interventions across all buildings in South Ayrshire

Measure	Heat Demand Reduction (kWh/y)	Fuel Savings per Investment Cost
Cavity Wall Insulation (CWI)	40,800,000	0.220
Internal Wall Insulation (IWI)	3,400,000	0.113
External Wall Insulation (only wall measure)	37,800,000	0.079
External Wall Insulation (alongside CWI or IWI)	78,400,000	0.023
All wall insulation measures	**160,400,000**	**0.040**
Loft insulation upgrade from <100mm	26,300,000	1.003
Loft insulation upgrade from 100-250mm	64,800,000	0.529
Loft insulation upgrade from 250-300mm	90,500,000	0.227
All loft insulation measures	**181,700,000**	**0.430**
All Single to Double Glazing upgrade	**6,600,000**	**0.064**
Cylinder insulation upgrade from <50mm	14,500,000	0.216
Cylinder insulation upgrade from 50-80mm	2,000,000	0.110
All cylinder insulation measures	**16,600,000**	**0.192**
All Combined Measures	**365,300,000**	**0.062**

7.4 Domestic Energy Efficiency and Fuel Poverty

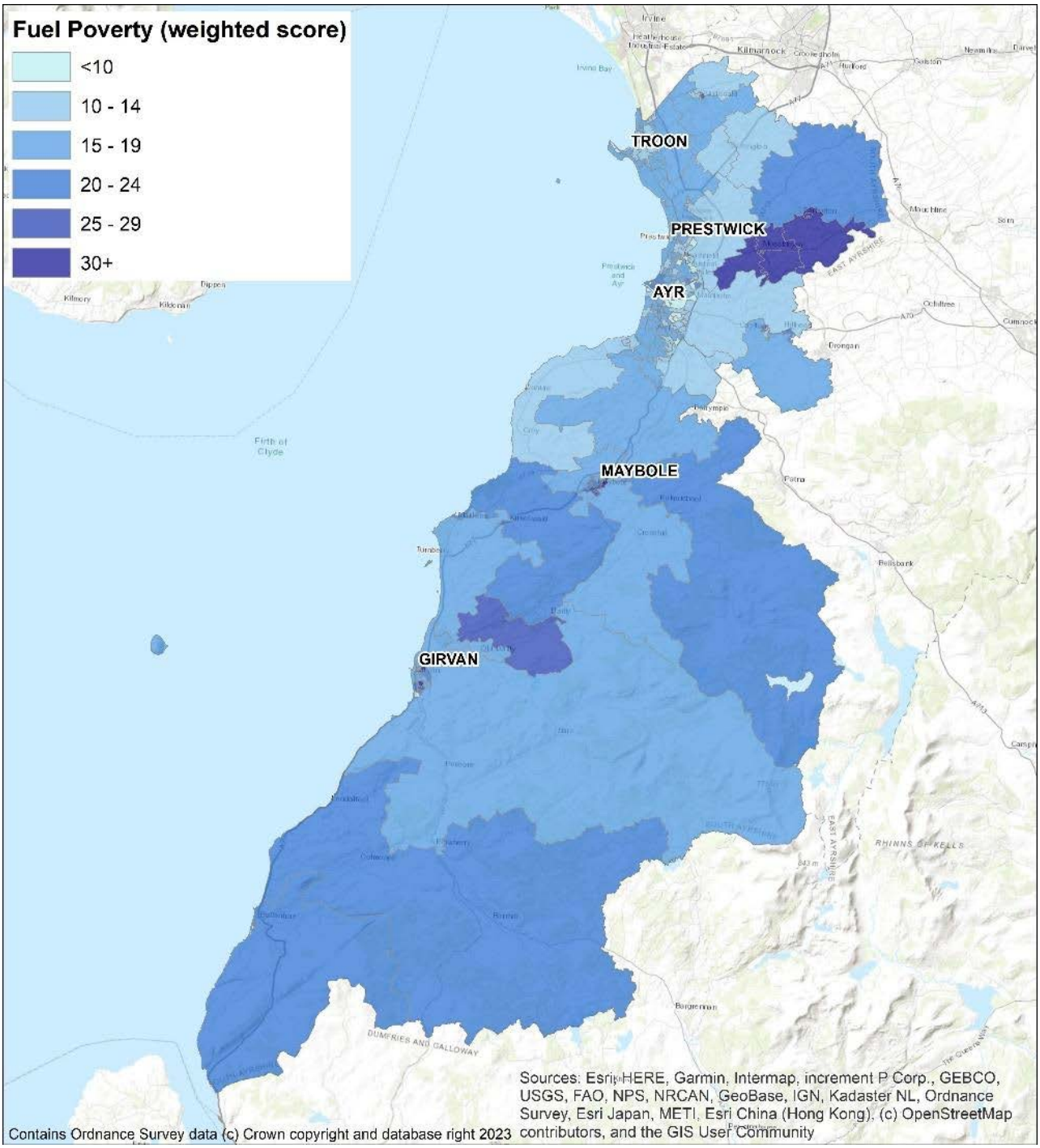
The Weighted scores for fuel poverty as a results of poor energy efficiency for the strategic zones, using the default weightings have been calculated for the Strategic Zones (Table 7). These are mapped against the data zone levels in figure 9. Carrick and Girvan stand out above the others and the interventions discussed in 7.4 will reduce the scores.

Table 7: 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
Carrick	34 %	43 %	31
Kyle	21 %	7 %	18
Ayr	22 %	9 %	19
Girvan	33 %	21 %	27

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
Maybole	27 %	15 %	23
Prestwick	18 %	4 %	19
Troon	19 %	4 %	18

Figure 9: Map of Energy Efficiency as a Driver of Fuel Poverty – Data Zone Level



Challenges

- Data reliability is good for domestic, but there is a need for localised knowledge, engagement, and improvement to deliver successful interventions,
- Scale of intervention required,
- Current funding streams are not adequate to meet scale of challenge.

Focus

- ***Priority 1****:* Prioritise areas and interventions highlighted through the baseline work,
- ***Priority 1, 2 & 3***: Assess funding and capacity issues around delivery of measures.

Consultation Question 4

Do the identified analysis zones and delivery pathways in Section 7 adequately reflect the social and physical landscape of South Ayrshire?

8. Technology

8.1 Options

There is no single solution to decarbonisation of heat, certainly not on the scale that LHEES is working from. Currently the most viable options from Table 2 for low carbon heat sources are:

- Heat pumps
- Heat networks
- Electric heating

Each property owner will make decisions on which route of change and technology is most suitable for them and their property, at this stage of the LHEES work we seek to outline the most suitable technologies for different properties.

8.2 Heat Pumps

All properties have been assessed for suitability for heat pumps as part of the LHEES, with the method and results available in the **full technical report,** section 7.7.3 and Appendix G. This is an overview, and in practice there will be assessments done on a case-by-case basis, however the DESNZ Electrification of Heat Demonstration project[13] 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."[14]

As a result, of the 58,000 domestic properties in question, 28,445 could currently be suitable for heat pump installation. This includes individual and communal heating systems.

This level of electrification of heating could place significant pressures on the electricity grid. A key action in the delivery plan is to develop engagement with Scottish Power Energy Networks (SPEN), alongside close working with the Ayrshire Energy Masterplan. Increased coordination with commercial and grid investment planning in the near to medium term will improve longer term area-wide delivery, allowing for early warning of potential grid constraints and reducing risks and barriers to delivery.

Challenges

- Poor installation or incorrect measures risk increasing energy costs and making fuel poverty worse,
- Grid capacity may constrain large scale roll out of heat pumps,
- High installation costs

[13] Electrification of Heat Demonstration Project: winning bids, case studies and project data - GOV.UK (www.gov.uk)

[14] All housing types are suitable for heat pumps, finds Electrification of Heat project - Energy Systems Catapult

Focus

- ***Priority 1 & 2****:* Prioritising no/low regret options
- ***Priority 2****:* Monitoring energy costs and funding availability
- ***Priority 2****:* Engagement with Scottish Power Energy Networks in developing area wide approaches.

8.3 Mixed Tenure, Mixed use and Historic

Listed buildings and conservation areas

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

There are around 1,350 listed domestic properties (data for non-domestic has not been provided). Only 19 % have EPCs rated C or better, with 14 % being F or G.

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

There are a little over 4,600 domestic properties in conservation areas (around 8 % of the homes in South Ayrshire), with the vast majority being owner occupied.

Mixed use buildings

Around 1,700 domestic properties (3 %) of total are recorded as flats in mixed use buildings. The potential energy efficiency interventions for these properties are laid out in Figure 17, section 7.8 of the **full technical report**. Almost all of these properties are owner occupied or privately rented. As with the general stock, wall insulation appears to be a big target for this typology.

Challenges

- Limited direct influence on energy efficiency or heat type,
- Unique and challenging building types,
- Increased cost and challenge for interventions.

Focus

- ***Priority 1 & 2****:* Prioritising no/low regret options,
- ***Priority 2 & 3****:* Engagement with local and national groups and industry experts to monitor best practice,
- ***Priority 2 & 3****:* Identify and exemplify existing best practice within South Ayrshire.

Consultation Question 5

Do you agree with the areas of focus identified in Section 8 for the technology solutions outlined?

9. Heat Networks

Heat networks, often referred to as district heating systems, are area wide approaches to heating, and combined with sustainable heat sources will play a crucial role in decarbonising heat for our homes and businesses. Unlike traditional heating methods that rely on individual property heating, heat networks operate by sending heat from a central source to multiple buildings through a network of insulated pipes. Globally, 9% of final heat demand is met by heat networks, with European leaders such as Denmark, connecting to 65% of domestic properties.

One of the key advantages of heat networks is the option to use different sources of heat, such as large-scale heat pumps using water, ground, or waste as heat sources, geothermal, and waste heat from industrial processes.

Scottish Government has identified heat networks as a key technology in meeting our climate change duty and assigned output targets through the Heat Networks (Scotland) Act 2021, the first of which is in 2027.

9.1 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” – consumers which are large, stable, and likely to connect.

To assess these factors, the Scottish Heat Map data was supplemented with data from the Council on fuel consumption within their estate. A data validation exercise was carried out to remove any duplicate points, heat demands which were uncertain, dubious heat loads and buildings in sectors less likely to enter into commercial agreements. 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.

Further validation of both the actual heat demands of the buildings and their suitability for connection to heat networks will be assessed before identifying future heat network areas.

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 properties, potential sources of heat and areas of future development.

The linear heat density method was used – involving 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:

- A baseline scenario (purple shades throughout this analysis) using 4,000 kWh/y/m where the circle around each property (in kWh) is divided by 4,000 to give a radius in metres around the property; and
- A stringent scenario (green shades throughout this analysis) using 8,000 kWh/y/m where the radius of the circle is the heat load in kWh divided by 8,000.

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

Finally, the areas were filtered based on whether a continuous area could be formed where the circles around each heat load formed, which enclosed heat loads totalling 15,000 MWh/y or more.

This heat load represents a 3 MW heat source operating for 5,000 full load equivalent hours per year. The purpose is to identify those areas where it is likely that there is 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.

9.2 Overview

An analysis of the potential for heat network zones indicates that there are broadly two areas where heat networks may be viable – within Ayr and an industrial cluster near Girvan.

Within Ayr there are three separate zones identified, however, this strategy considers them in the context of a single heat network strategy for Ayr rather than considering them three discrete opportunities.

9.2.1 Ayr

The analysis shows that there is a cluster of properties in the town centre, South of the river, which could be considered an area for district heating (Figure 10). This area has both sufficient total load to consider constructing a new network and associated infrastructure, as well as a number of anchor loads including Council owned buildings.

North of the river, there is a heat network area which could be connected to the town centre by one of the bridges crossing the river to form a single heat network opportunity. The business strategy areas highlighted in a red outline are also in this zone and the third to the North East.

A cluster of industrial buildings, Ayr_3_4000, differs from the town centre areas as there is a less diverse range of tenures and building types, and therefore close coordination with businesses is going to be important when considering any heat network development.

Working in tandem with the Ayrshire Energy Masterplan will ensure consultation and engagement of businesses, forming a coordinated approach to feasibility and development work.

The Ayr_3_4000 zone is also close to the Prestwick airport site. The Council will coordinate with stakeholders about any future opportunity for heat networks to serve the users of heat on this site.

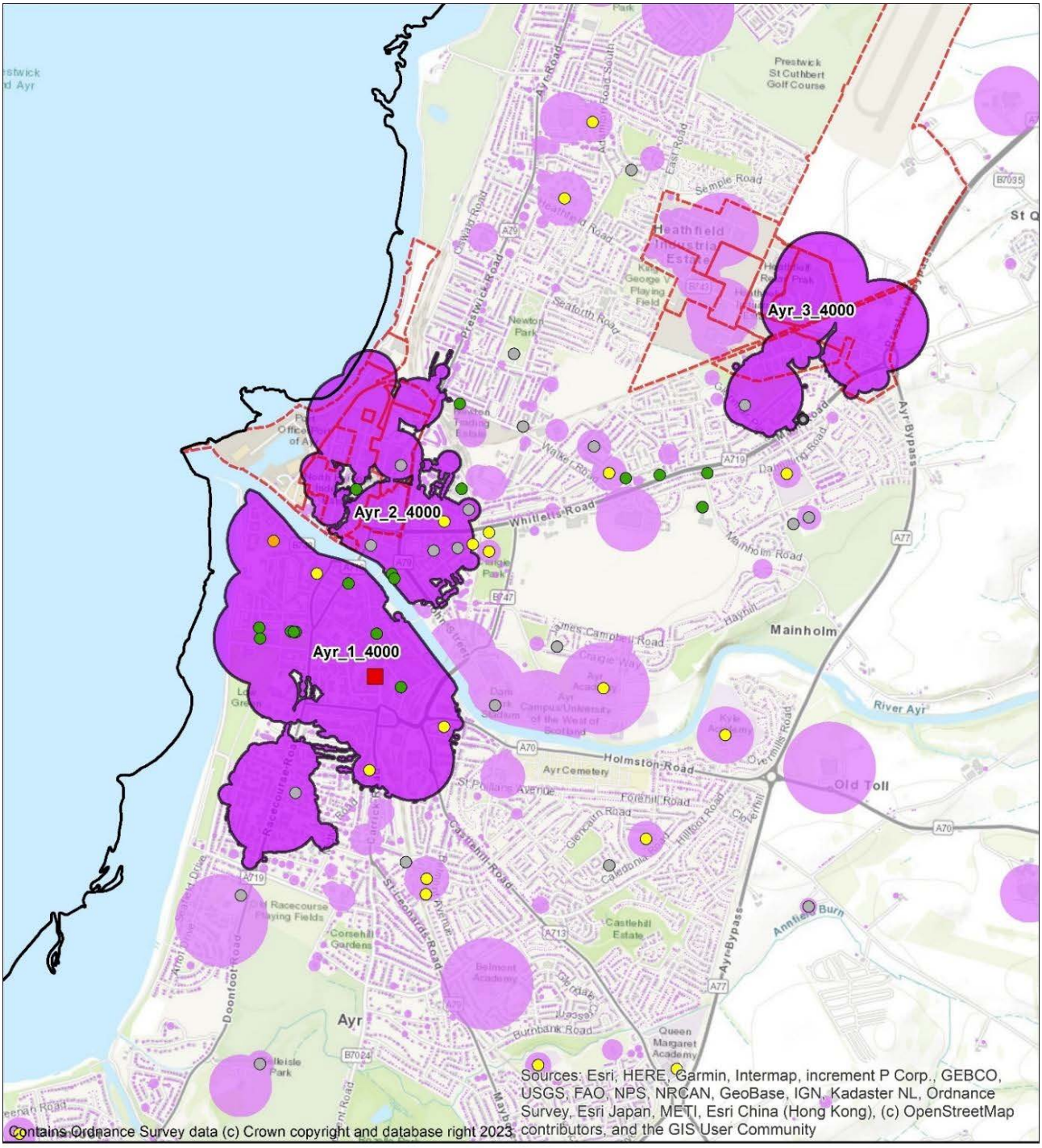
The town centre also contains a large number of listed buildings and a conservation area.

There are additional barriers to decarbonising historic buildings and a heat network could minimise the need for changes to the buildings while ensuring they are decarbonised. Heat networks avoid the need for significant heating plant to be located at each building.

More detailed investigation of each building is important to identify what the opportunities and constraints are for each specific building. Specific attention needs to be paid to:

- whether the existing heating system in the building is likely to be compatible with district heating
- the location of the existing heating plant the route to connect this to the district heating network
- protected attributes of the building and its surroundings

Figure 10: Ayr heat network opportunity – Baseline



Heat Demand (MWh)

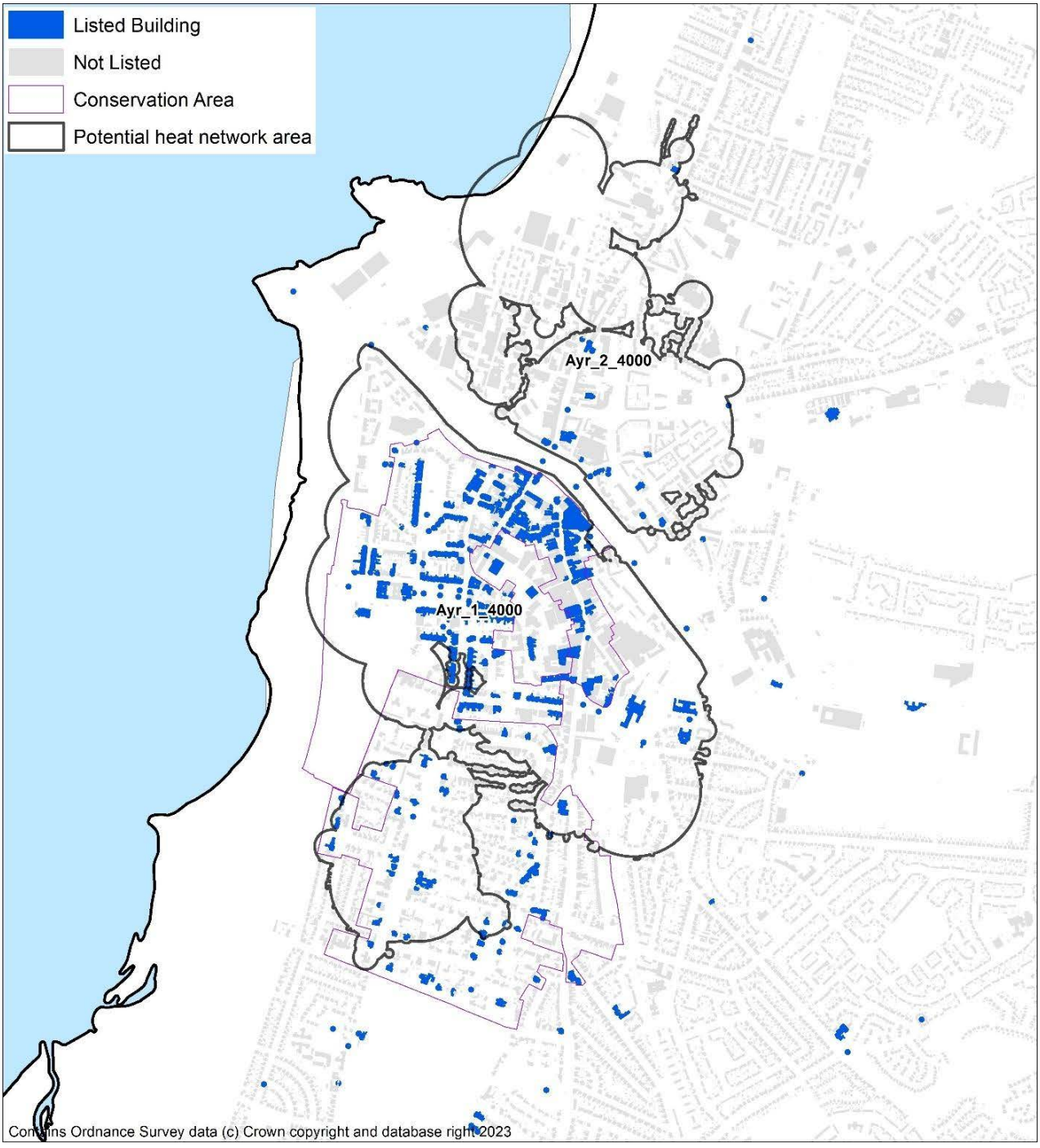
- <15,000
- >15,000
- Potential heat network area

Council Properties

- Office
- School
- Swimming Pool
- Other

- Potential Redevelopment Site
- Strategy Area

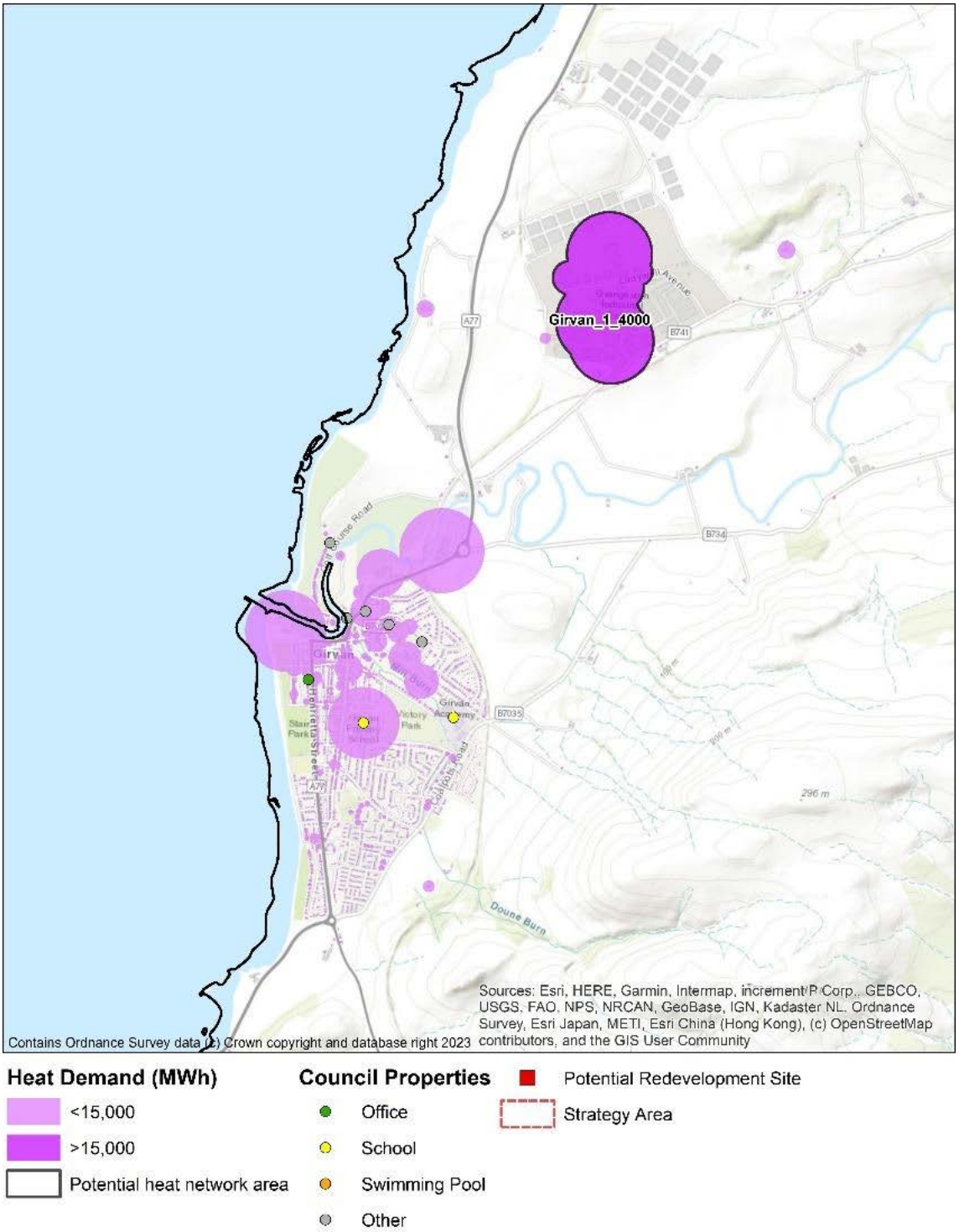
Figure 11: Listed buildings and conservation areas



9.2.2 Girvan industrial cluster

An industrial cluster was identified to the North of Girvan which includes a substantial use of industrial energy including heat. This site has complex energy flows and houses both a Biomass CHP and a substantial anaerobic digestion site and involves a number of industrial businesses. However, a heat network feasibility study determined that there are not currently significant heat demands sufficiently close to the site to allow a district heating scheme to be developed. If significant future developments were to be planned near the site then the opportunity for heat networking could be revisited and local plan zoning may be a lever to influence this. The feasibility study may be revisited in the future.

Figure 12: Girvan industrial heat cluster



There is an existing feasibility study for district heating from the site to Girvan itself, however current markets are not financially viable. The feasibility study will be revisited as the industry develops within Scotland.

It is not within the scope of LHEES to consider other energy vectors, however, the site is in close proximity to the transport corridor containing the A77 connecting the Central Belt of Scotland to the ferry ports of Cairnryan and Larne. As such, there could be a substantial road transport fuel demand in this area and the site, and its energy flows should be considered as part of any future low carbon transport fuels for the area.

Challenges

- Relatively low levels of heat density in South Ayrshire resulting in 3 potential heat network zones,
- Engagement and feasibility are still at an early stage,
- Capital costs and delivery models.

Focus

- ***Priority 2:*** Coordination with AEM work to build feasibility studies for identified Heat Network zones,
- ***Priority 2:*** Redevelopment of Girvan Heat Network feasibility,
- ***Priority 3****:* Continued skills development in SAC through engagement with other local authorities, industry, and international mentoring programs.

Consultation Question 6

Do you think the areas of focus in Section 9 are suitable and sufficient for approaching heat network development within South Ayrshire?

10. Delivery Areas

In this section we set out potential routes to approach interventions, looking at how we identify and prioritise areas for action.

These approaches will use the data developed from the LHEES methodology to show where interventions can be delivered in a way that creates the most positive impact for the funding available. This is done using weighted scores as discussed in section 7. The **full technical report** gives further detail on the assessment and weightings applied to the Home Analytics data in *Appendix C* for intermediate zones, *Appendix D* for data zones, and *Appendix I* for the weighting and calculations. These have been completed in relation to the relevant LHEES considerations as shown in table 1, 4.2.

Delivery areas have been developed for both a spatial and for technology-led approaches.

10.1 Spatial approach

Through the spatial approach, characteristics of buildings have been considered and compared on an area-wide basis with respect to the LHEES considerations. This has been considered at intermediate and data zone levels, with overviews given at strategic zone levels as shown in section 7.

This type of analysis allows locations to be identified for area-based funding and focuses action to where it could deliver the greatest benefit.

Domestic energy efficiency

Weighted scores for domestic energy efficiency are distributed unevenly across South Ayrshire with higher scores indicating poorer energy efficiency and a greater potential for demand reduction. There are a small number of zones with significantly worse scores, showing value in addressing measures in specific geographical areas.

These areas with the highest scores are a priority, however amongst the top scorers, most homes are in the private sector. This points to a need to address the problems both by spatial zoning and by targeting properties by tenure and technical intervention; for example, a possible lack of wall insulation is the biggest contributing factor to the weighted score in each top delivery area.

Energy efficiency as a driver of fuel poverty

Weighted scores in this section are distributed unevenly across South Ayrshire, with higher scores indicating a greater risk that families are experiencing fuel poverty as a result of poor energy efficiency. There are a small number of zones with significantly worse scores, suggesting that there is value in addressing energy efficiency measures in specific geographical areas.

Mixed tenure, mixed use, and conservation areas

Mixed-tenure and mixed-use properties have unique challenges for the implementation of interventions as they have multiple stakeholders to engage that may have conflicting interests. Mixed-tenure buildings are those which have multiple properties of the same use but differing ownership type, 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.

Due to the large number of stakeholders and challenges in this area, a dedicated working group is seen as the best course of action for delivery in mixed use and tenure areas.

Relatively few data zones have homes within conservation areas. The top three zones in Ayr South Harbour and Town Centre are amongst the worst performing zones according to energy efficiency scores and so

some conservation areas will be priorities in this stage of LHEES. Additional strategic assessment is required early in the LHEES delivery period to work towards decarbonisation in this area.

The top data zones for listed domestic properties are Ayr South Harbour and town centre, Troon and Carrick north. These are also some of the poorer performers from the point of view of energy efficiency. Consequently, as in the conservation areas, further strategic assessment for this building type will be developed early in the LHEES delivery phase.

Challenges

- Mixed tenure, mixed use, conservation areas and listed buildings present significant challenges in area-wide decarbonisation,
- Traditional high street buildings present increased challenge.

Focus

- ***Priority 2:*** Creation of working group to ensure mixed use and tenure buildings are considered within area wide approaches,
- ***Priority 2 & 3:*** Monitor nation landscape and connect and build on current internal capacity for further strategic assessment of conservation and listed building decarbonisation.

10.2 Fuel Poverty

The fuel poverty indicator analysis used in the baseline tool was supplemented with additional analysis based on the heat demands and fuel type presented in the Home Analytics dataset and the subsequent cost to the heat each property based on the utility prices given in Table. This building-level analysis was aggregated to intermediate zone and is intended to provide an indication of how affordable it is to heat houses in each area and is not a detailed prediction.

Table 8: Fuel prices used in fuel poverty analysis

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	£0.45
Electricity	£0.27

The number of homes in each income decile are given in Table; 60 % of homes are in decile Five or lower. The 10 least affordable Intermediate Geography Zones, those with the fewest percentage of homes which could be affordably heated by households in income decile Five or lower, are listed in in Table.

Table 9: Number of homes by SIMD income decile

SIMD Income	Number of homes	Percentage of homes by income decile
One	5,920	10%
Two	4,960	9%
Three	4,080	7%
Four	9,980	17%
Five	9,790	17%
Six	2,840	5%
Seven	4,430	8%
Eight	4,230	7%
Nine	7,250	13%
Ten	3,840	7%

Table 10: Percentage of homes which could be affordably heated by households in income decile five or lower

Strategic Zone	Percentage of homes which could be heated by households in income decile five or lower without being in fuel poverty
Carrick	18 %
Kyle	60 %
Girvan	73 %
Ayr	74 %
Prestwick	74 %
Troon	78 %
Maybole	84 %

10.2.1 Social Impact of Multiple Deprivation

The Local Heat and Energy Efficiency Strategy and Delivery plan consider fuel poverty where it can be reduced through energy efficiency measures. Understanding which locations have higher rates of overall deprivation as well as specifically income deprivation, can inform decisions on areas of focus.

Figure 13: Map of overall SIMD rank

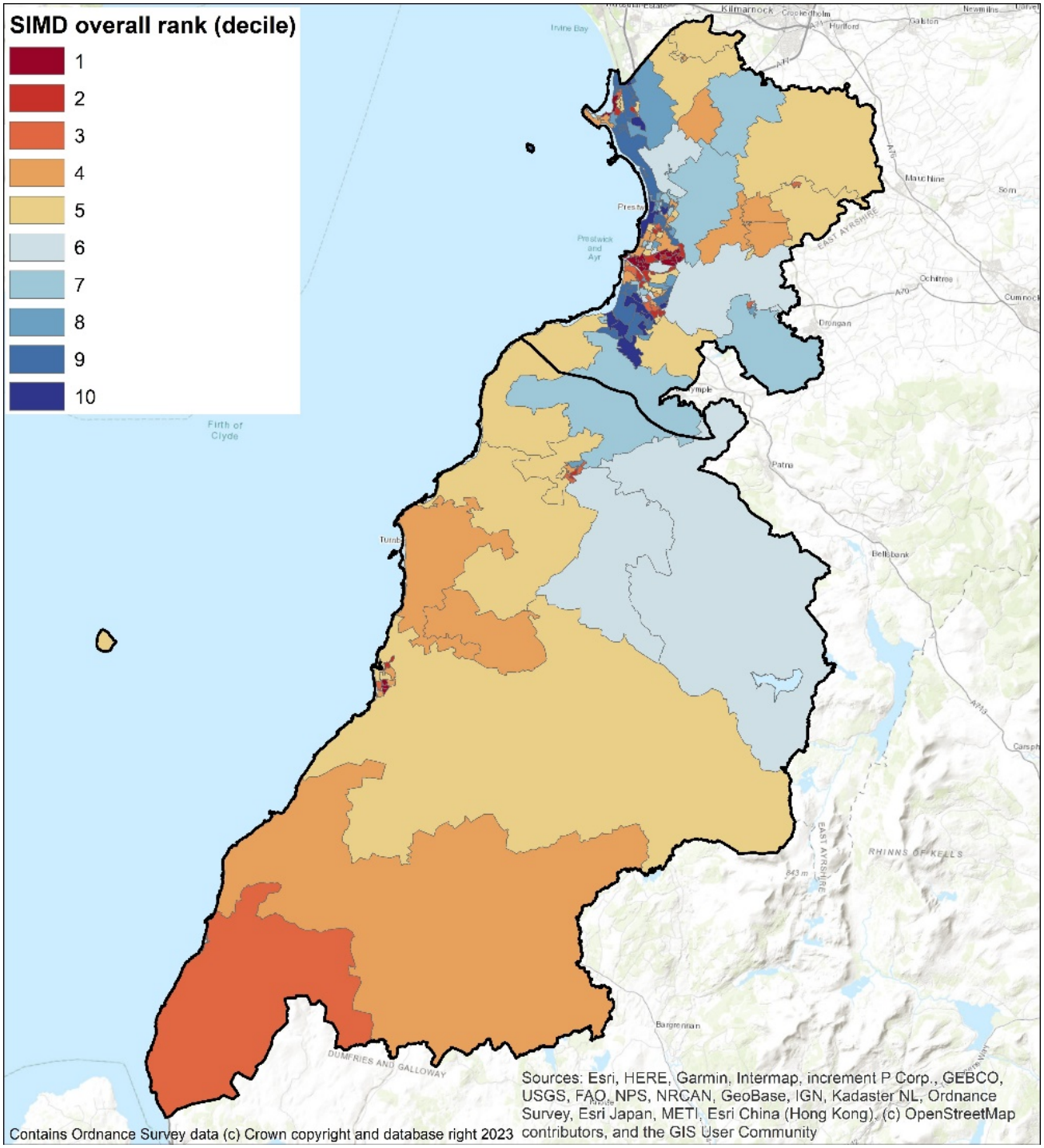
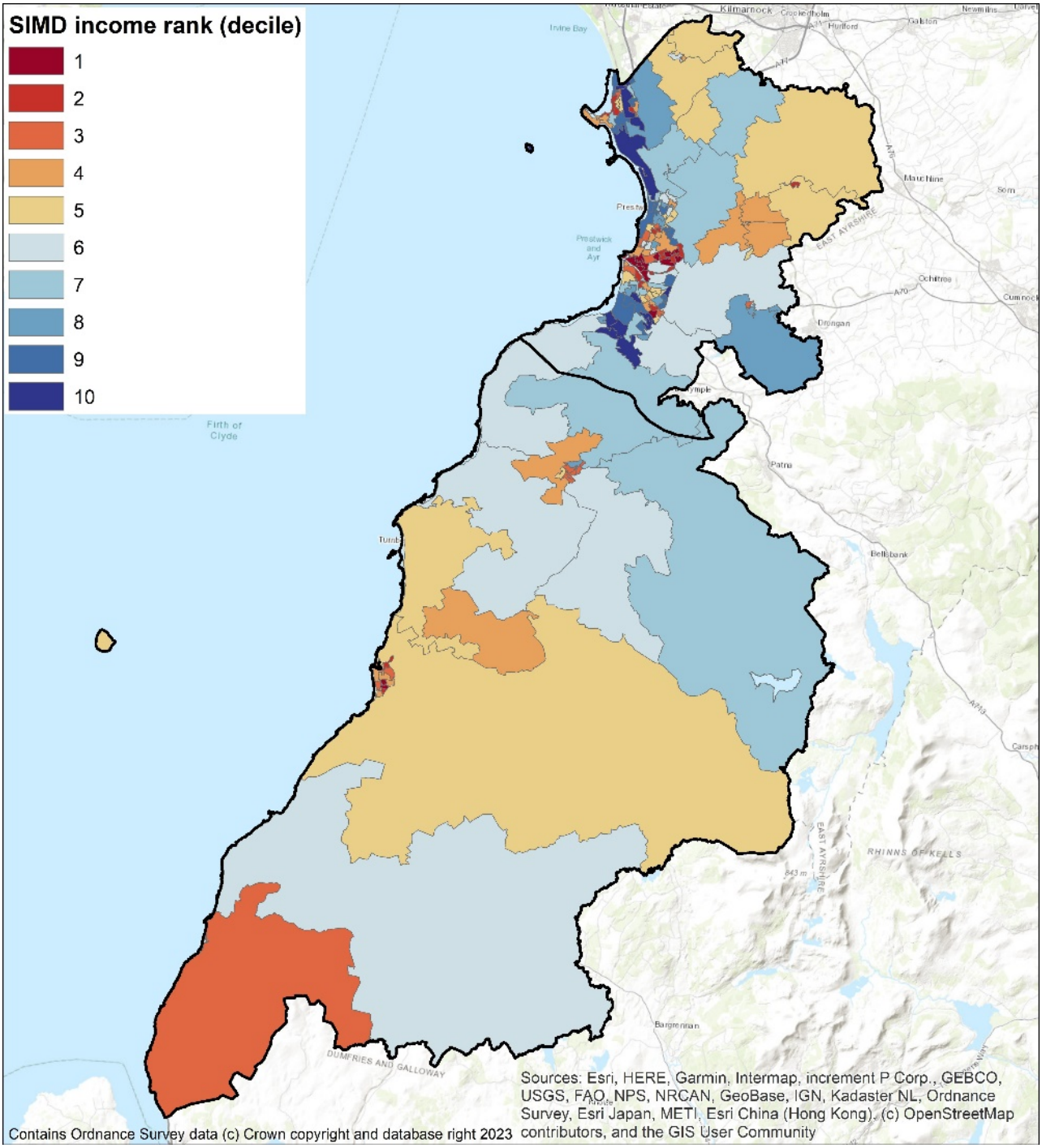


Figure 14: Map of income SIMD rank



10.2.2 Overlaying Multiple Considerations

The analysis has generated various rankings for the purpose of determining where to start with interventions. The Weighted Energy Efficiency Score and Fuel Poverty rankings are, thanks to the latter being based on the former, very highly correlated and can be used interchangeably with similar outcomes. However, SIMD and income ranks are not correlated with the Weighted Energy Efficiency Score. Data zones with the worst energy performance are found to be ones which are relatively affluent, so addressing funding towards fuel consumption reductions would not address the issue of real-world fuel poverty. However, since

there are likely to be income poor households in areas which are more affluent on average, the poor energy efficiency of those properties or the relative lack of energy efficient properties does still warrant targeted intervention. This will be developed within this iteration of LHEES.

These observations lead to prioritisation approaches taking account of multiple factors, rather than a single approach.

Challenges

- 60% of homes in decile 5 and lower
- SIMD and income ranks are not correlated with the Weighted Energy Efficiency Score
- Multiple factor assessment required

Focus

- ***Priority 1:*** Integration of SIMD ratings in intervention targeting,
- ***Priority 2:*** Cross departmental working to ensure LHEES actions connect to other strategy, policy and projects.

Consultation Question 7

Do you agree with the focus areas identified in Section 10?

Are there any other considerations you would like to see used to identify priority delivery areas?

10.3 Technology-Led Approach

As an alternative to the spatial approach, this approach groups interventions by tenure and fuel type, which would affect the viability and benefit of key technology interventions. This allows alternative means of targeting properties for interventions, either in our own properties or to assist other stakeholders in identifying changes they can make.

10.3.1 Technology Groupings

In addition to considering the data on buildings from the view of a weighted score by data zone, analysis was carried out to assess interventions based on fuel type and tenure. The LHEES is a strategy for the whole of South Ayrshire Council area, therefore it is important to consider not only what measure can be implemented but who the decision maker is for these measures. This cost benefit comparison will be a vital element of engaging with stakeholders and the wider public.

The Council can play a different role in encouraging the installation of energy efficiency, and the adoption of low carbon heat sources, so this analysis is intended to inform decisions throughout the next 5 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 (section 9) are a key technology in areas with higher heat density makes them viable and in some new build estates. The second option, which is the main route forward for buildings across South Ayrshire, is installation of heat pumps either for a specific dwelling or a communal system serving a number of dwellings, such as a block of flats.

There are a range of technologies which could be considered for properties less suitable to heat networks or conventional air-to-water heat pump technologies. These include biomass, direct electric heating, air-to-air heat pumps, and high-temperature or 3-phase air-to-water heat pumps.

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.

It should be noted that these represent a list of all potential interventions, rather than specific projects or commitments. This can be seen in the **full technical report**, table 14, section 8.2.3.

10.3.2 Heat Pump Suitability

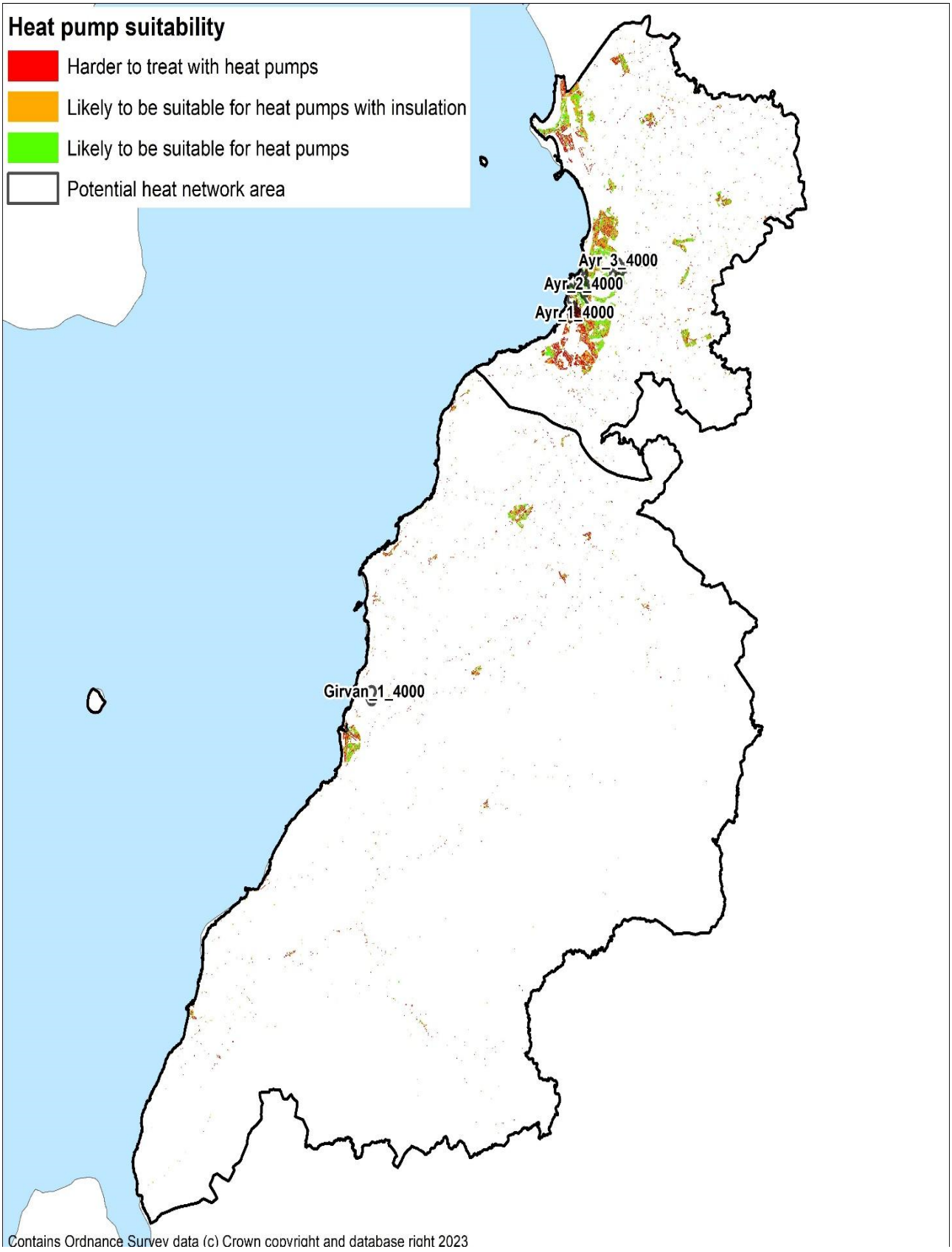
This section highlights where there are a significant proportion of properties where there is a greater challenge with implementing a heat pump solution, even after reasonable energy efficiency measures are considered.

Low temperature solutions may be possible by solving challenges for a specific building type. Other technologies such as air-to-air heat pumps or exhaust 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. Detailed maps are provided in Appendix C, and a mapped overview of heat pump suitability is shown below in Figure 15.

Figure 15: Heat pump suitability and potential heat network areas



11. Pathways for all of South Ayrshire

11.1 Decarbonisation of Heat Pathway

The journey to the decarbonisation of each domestic property in South Ayrshire is shown in Figure 16.

The first column shows the proportions of properties which begin with each fuel source.

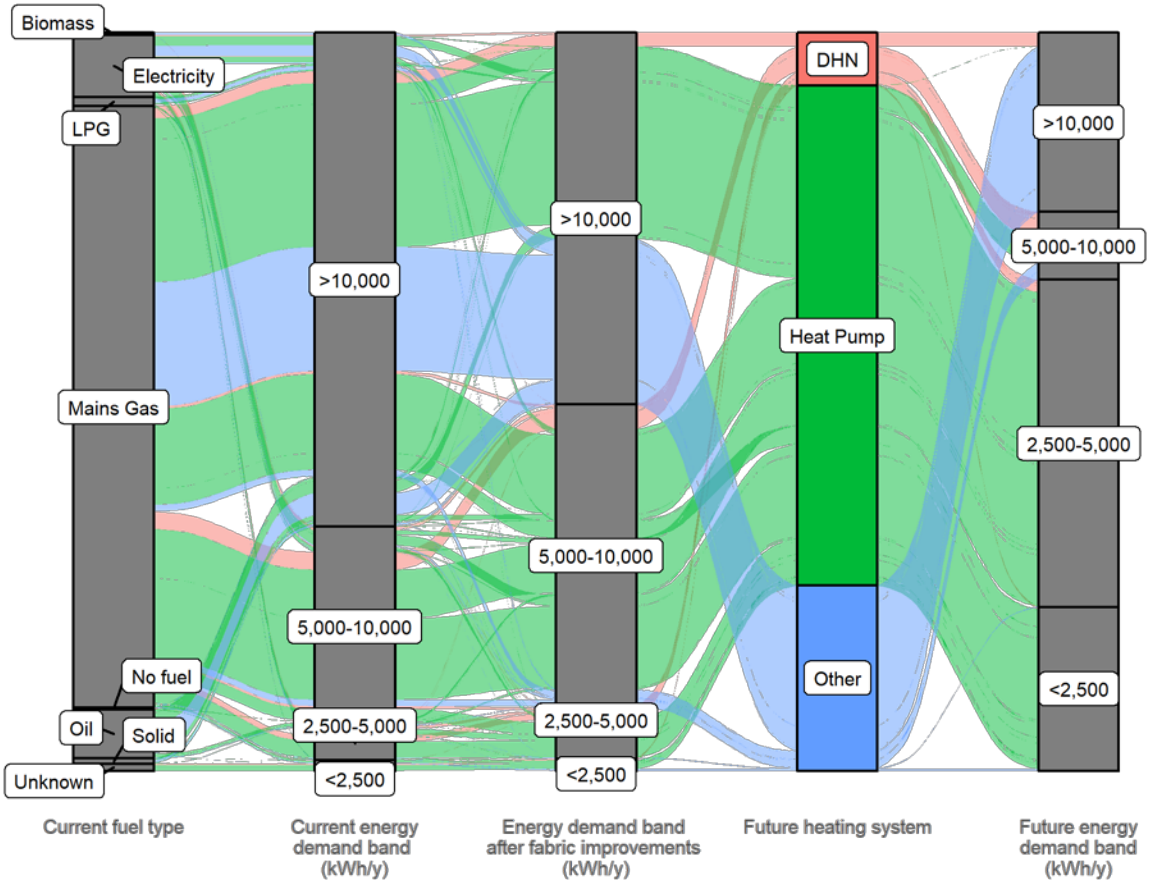
The second groups the properties by their current total heat demand in kWh/year.

The third column show changes to heat demand once reasonable energy efficiency measures have been applied.

The fourth column shows how suitable each property is for each of the low carbon heat measures. This assumes all listed heat network zones are developed but doesn't consider further expansion.

Finally, the column on the right shows the final future heat demand.

Figure 16: Decarbonisation and energy efficiency pathway



The shifting of individual properties down from one energy demand band to the next is visualised in Figure 17, where the comparison of heat pumps to direct electric heating shows how effective heat pumps will be in reducing the risk of fuel poverty.

At a local authority level, Figure 18 shows how interventions and shifting demand could reduce the total heat energy consumption. It is also shows that heat pumps on their own make a bigger difference to energy demand than fabric improvements but fabric improvements have a vital role in both demand reduction and in making homes suitable for heat pumps.

Figure 17: Shifting energy demand by fabric improvement and heat pump installation

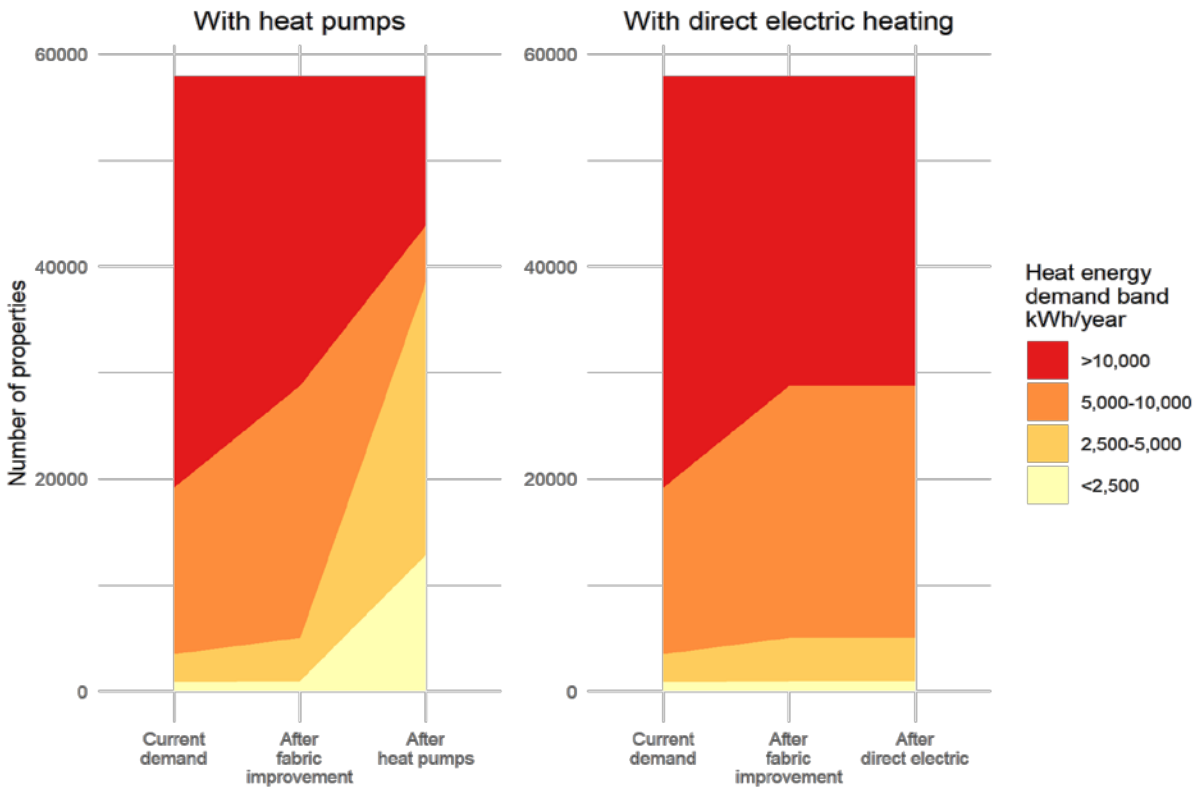
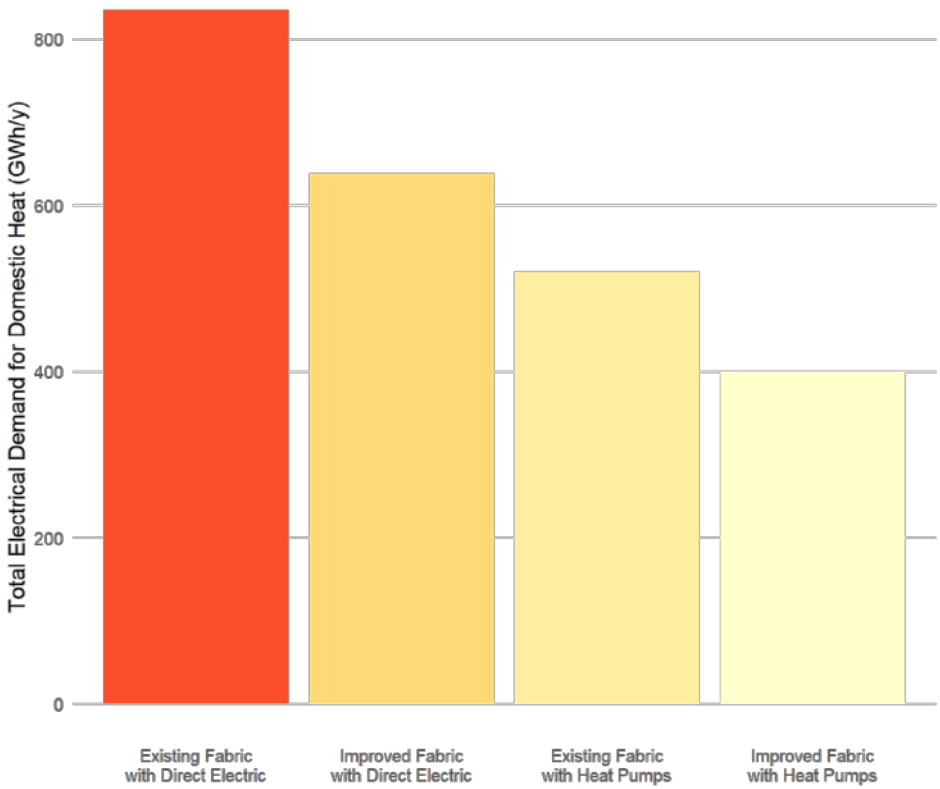


Figure 18: Total electricity demand reduction after energy efficiency measures and/ or heating system upgrade

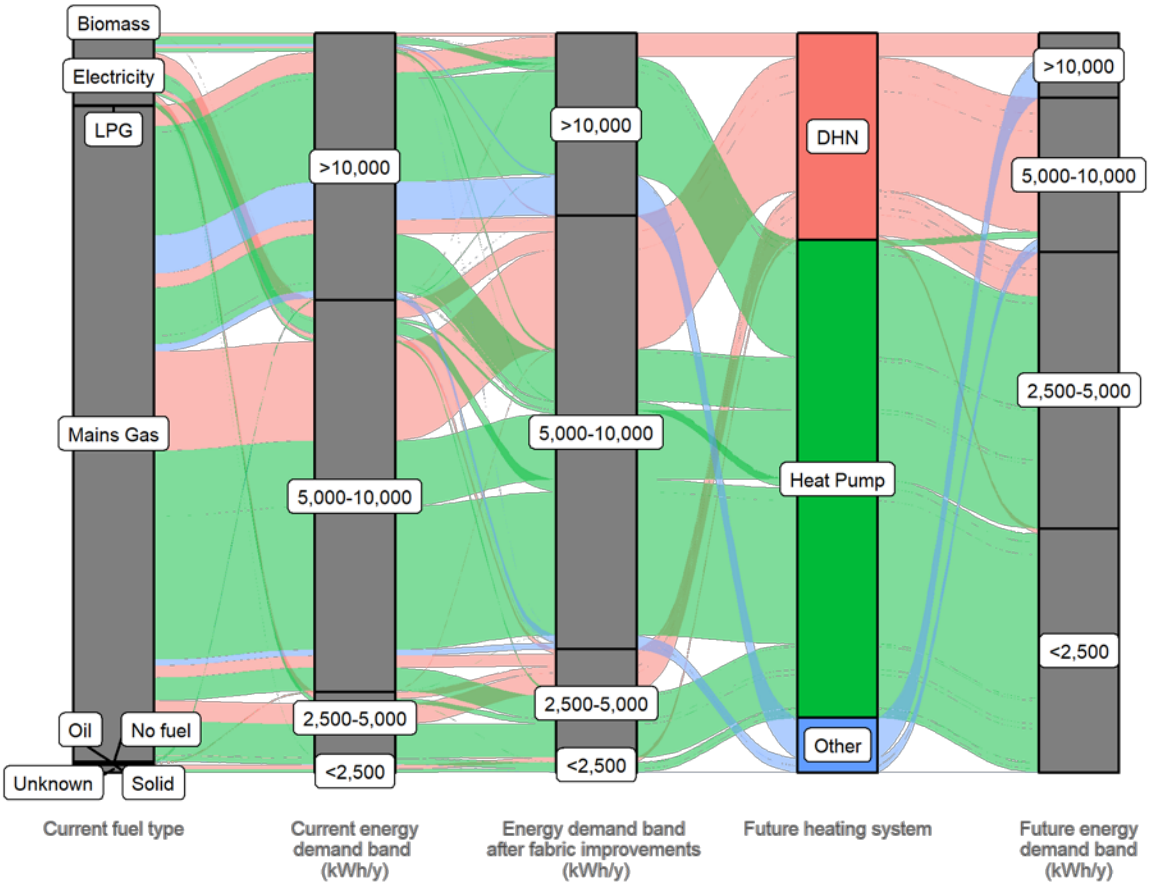


11.2 Fuel Poverty

Reducing the heat demand of the buildings through installing energy efficiency measures is clearly important as it can both reduce the amount of heat to be decarbonised and the cost of heating. This section examines the properties in the areas with the lowest SIMD score 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 and, consequently, on their risk of fuel poverty.

Figure 19 shows the decarbonisation journeys for properties which have a SIMD score of 1, the most deprived areas. This shows the main heating fuel they use at present, the proportion of properties in each energy demand band (kWh/year) and then the numbers in each band after energy efficiency measures and low carbon heating technologies are installed.

Figure 19: Effect of actions in all properties in SIMD 1 areas – energy efficiency and heat pumps



Installing energy efficiency measures significantly reduces the number of properties with heat demands of over 10,000 kWh/year. Utilising heat pumps reduces this further to a very small proportion but also results in one quarter of homes being in the lowest band, with an annual demand of <2,500 kWh/y. For the purposes of this Strategy, heat pumps are considered the preferred solution to minimise fuel poverty, in properties where low-cost district heating is not an option.

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.

Unheated homes

The Scottish Housing Condition Survey 2019[15] 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 both reduces how much it would cost them to heat their home, should they be able to do so, and limits 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 as to whether to focus capital spend on additional insulation measures or lower cost heating systems is therefore complex.

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.

11.3 Heat Networks

Heat networks have a role to play in the future of heat in South 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 phrase “heat networks” refers to district heating schemes where multiple buildings are connected by underground pipework.

The suitability of the buildings for connection to heat networks is not known. Further work such as Building Assessment Reports (BARs)[16] and engagement with stakeholders is important to inform future decisions on these sites.

Even in the zones where heat networks are an option, there are differences between the domestic properties which are most likely to be suitable, such as blocks of flats, and properties which are less likely to be suitable, such as detached houses[17].

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 we consider all 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 date.

11.4 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, **has to lead to a cost of heat that is comparable to 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 equally many good experiences, it is essential to understand what is required for heat pumps to meet the needs of residents. In order to ensure that the heat

[15] 5 Energy Perceptions - Scottish house condition survey: 2019 key findings - gov.scot (www.gov.scot)

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

[17] 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.

pump systems installed are of good quality and perform as expected, the sharing of good practice and case studies is emphasised.

South 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; 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. We will consider what actions the Council could take to encourage a local supply chain of low carbon heating installers.

While it is for each property owner to make their own decision on the heating system they prefer, there is a role for the 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 Scottish Government or UK Government.

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

Challenges

- Pathways represent long term ambitions and commitment,
- Skills and supply chain shortfalls are a national challenge,
- Poor quality or inappropriate interventions can make fuel poverty worse.

Focus

- ***Priority 3:*** Engagement with Prestwick Airport, further and higher education organisations on potential industry and skills development
- ***Priority 2:*** Ensure multi-level assessment on interventions to prevent adverse effects on fuel poverty,
- ***Priority 2:*** Maintain engagement with UK and Scottish Government's industry regulation on heat network development.

Consultation Question 8

Do you agree with the focus areas identified in Section 11?

Are there any other considerations you would like to see to develop delivery pathways?

12. Pathways for Strategic Zones

The figures below show pathways for all domestic properties within the South Ayrshire Council areas, from the left:

- the heating fuel each uses today,
- the energy demand of the property per unit of floor area,
- the energy demand after the application of reasonable energy efficiency measures, and,
- finally, the most suitable heating technology for each property at present.

These are detailed further in the **full technical report**, Section 10.

Figure 20: Decarbonisation pathway for domestic properties in Ayr

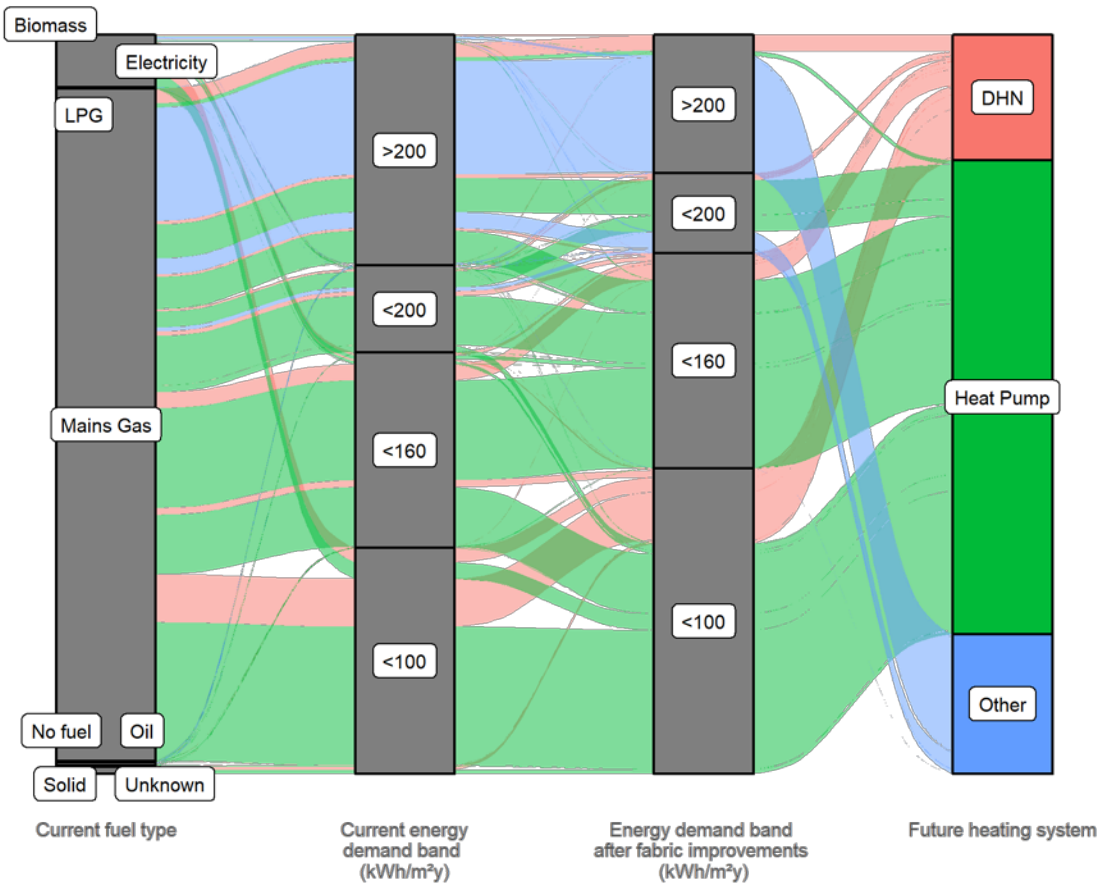


Figure 21: Heat decarbonisation pathway for Carrick

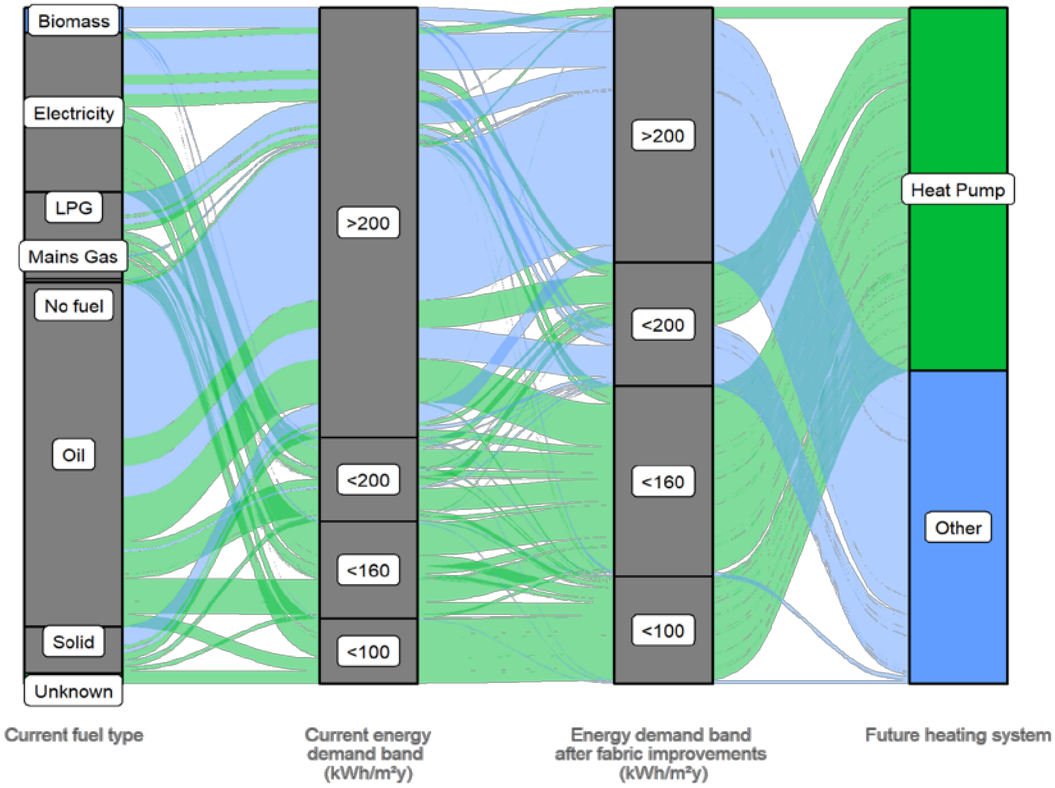


Figure 22: Heat decarbonisation pathway for Girvan

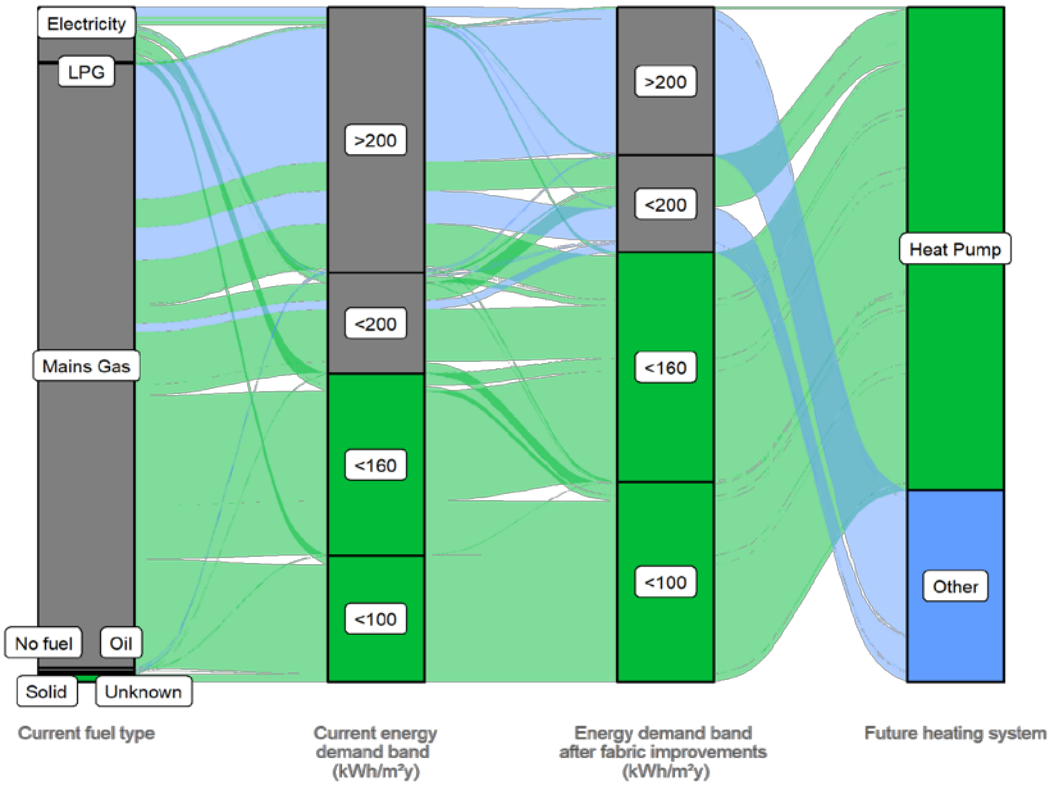


Figure 23: Heat decarbonisation pathway for Kyle

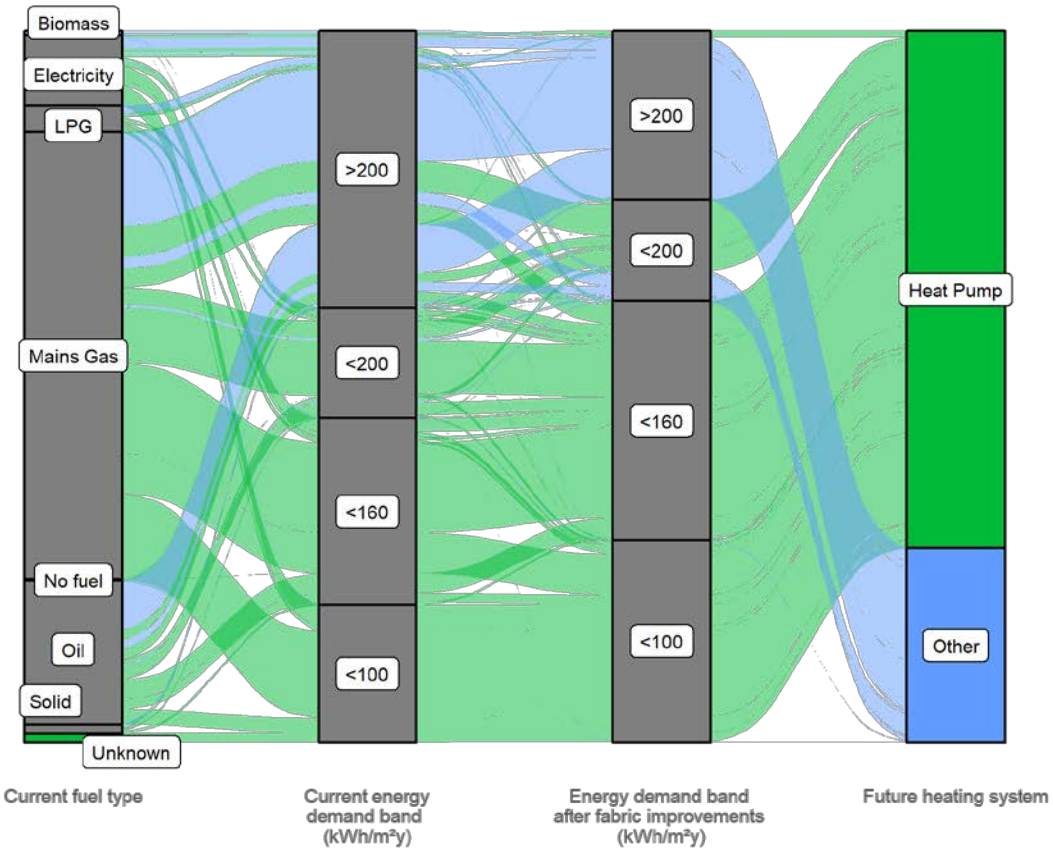


Figure 24: Heat decarbonisation pathway for Maybole

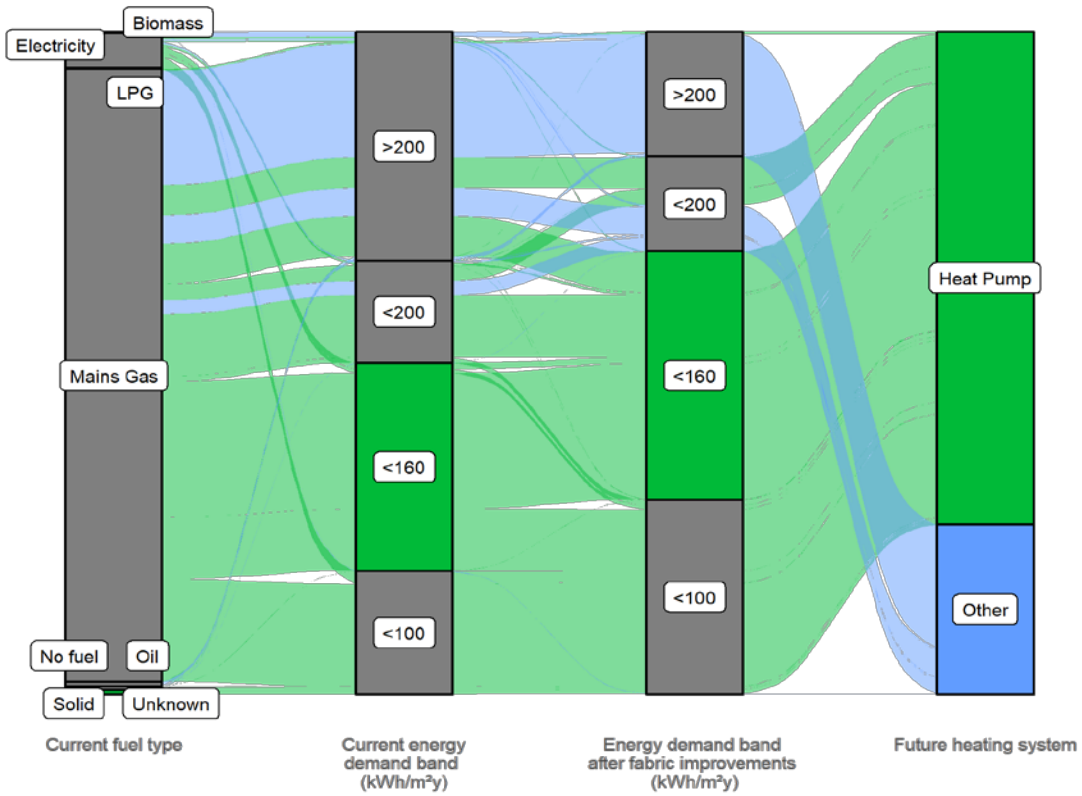


Figure 25: Heat decarbonisation pathway for Prestwick

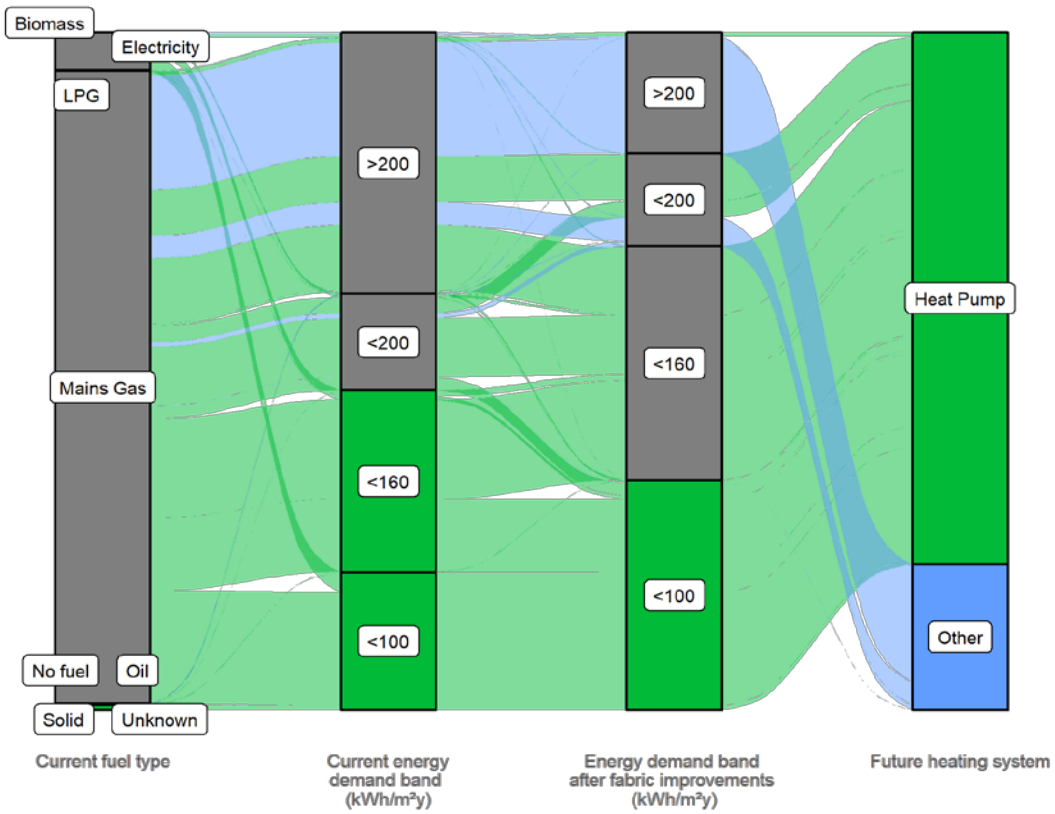
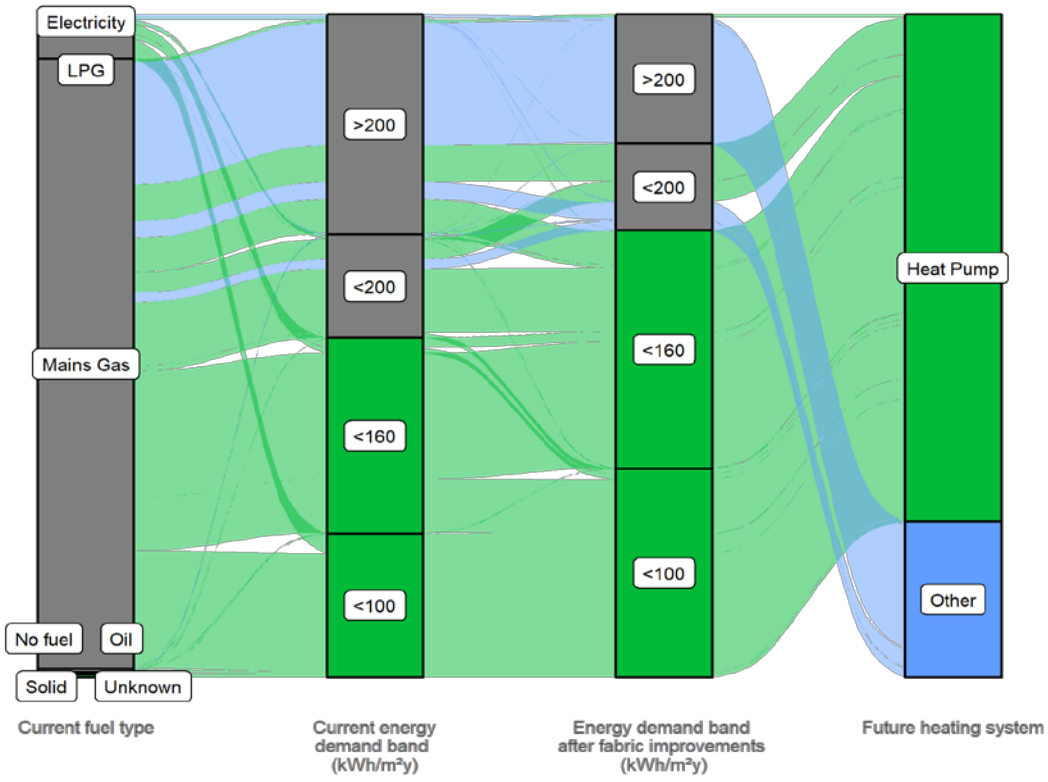


Figure 26: Heat decarbonisation pathway for Troon



13. Governance

This LHEES provides a first step towards decarbonising heat and reducing fuel poverty in South Ayrshire. In improving energy efficiency and prioritising low carbon solutions in areas where they can have the greatest impact, this strategy can support council and commercial investment, community engagement and wealth building, and an equitable energy transition. The delivery plan proposals are built from the data from the LHEES methodology and provide a series of potential projects from the challenges identified.

These challenges cannot be delivered in isolation by a single department, or by the Council alone. As such it is vital that a governance structure be put in place to ensure collaboration between internal and external stakeholders.

Figure 27 provides a potential structural overview for governance in this area. This will require development of roles and responsibilities, much of which will be developed through this consultation period and prior to the final strategy release. To ensure the successful delivery of LHEES actions, collaboration between stakeholders, internally and externally is vital.

Figure 27: Outline LHEES Governance model

Focus

- Establish stakeholder links and agree suitable governance structures.

Consultation Question 9

Do you agree with the governance structure outlined in Section 13?

Are there other established groups that should be considered?

14. Delivery Plan Proposals

As part of the LHEES process, a delivery plan will be prepared to support and direct actions. This will be a live document, updated regularly to reflect changes in national and local circumstance. As such, the proposals below are an initial overview of potential actions, that are likely to evolve over the course of the next year.

Table 11: Proposed Delivery Plan Actions

Action No.	Action	Timescale
1	Ensure sufficient dissemination of SAC LHEES delivery plan to all key internal and external stakeholders.	2024
2	Set up the working groups highlighted for: - LHEES Coordination and Strategy governance groups, - Specific issue areas such as mixed use/tenure and historic buildings	2024
3	Establish governance structure and agree meeting schedules	2024
4	Engage with other LA's, Universities, NHS trusts and other large public sector organisations to learn from their experience of decarbonisation and LHEES considerations on large estates.	2024-25
5	Engage with the public using educational material on energy efficiency, technologies, funding opportunities, methods to reduce heating bills, and suitable tariffs to encourage early adopters of heat pumps.	2024-26
6	Engage with the public on heat network potentials and technologies	2025-26
7	Create a shared forum for lessons learnt from early adopters on heat pump operational best practices.	2025
8	Create ongoing case studies of SAC decarbonisation and fuel poverty reduction implementations, and learn from other case studies, to create a live up to date lessons learnt document. Including contacting MCS/Ofgem/Scottish Government/UK Government about current heat pump performance and how to make sure high COP and a good experience is achieved.	2024-25
9	Set up a working group with SPEN to monitor network constraints to coordinate transition work.	2024-25
10	Engage with local colleges and local installers to assess skills gaps in heat pump delivery.	2024-25
11	Assess potential routes for the long-term investment required for the interventions.	2025-26
12	Engage with supply chains to allow the visibility of secure pipeline of work for several years to come, to encourage growth of local skills and reduce the risk of local skill shortage.	2025-26
13	Complete feasibility studies on proposed heat network zones.	2024-25
14	Annual monitoring/report of gas prices compared to typical cost of heat from heat networks to ensure potential heat networks do not worsen fuel poverty.	Ongoing
15	Commence development of business cases in all heat networks deemed feasible.	2025-26

Action No.	Action	Timescale
16	Assess loft insulation upgrades in the top third of LHEES data zones for SAC owned dwellings.	2025-26
17	Assess cavity wall insulations interventions in the top third of data LHEES zones for SAC owned dwellings, record ongoing progress.	2025-26
18	Assess hot water cylinder insulation upgrades in the top third of LHEES data zones for SAC owned dwellings.	2025-26
19	Assess internal or external wall insulation upgrades in the top third of LHEES data zones for SAC owned dwellings.	2026-27
20	Assess single to double glazing window upgrades in the top third of LHEES data zones for SAC owned dwellings.	2027-28
21	Assess with partner organisations and national groups any pilot studies / demonstration projects / field trials on heat pump deployment and operational best practises.	Ongoing
22	Assess heat pumps potential on case-by-case basis in properties that are currently using LPG/Oil/Solid fuels. Focus on the top third of data zones that are SAC owned.	2025-29
23	Assess heat pumps potential in properties that are currently using direct electric heating. Focus on the top third of data zones that are SAC owned, where they can be made suitable for heat pumps	2025-29
24	Coordinate with Scottish Government and collect improved datasets for 5 yearly LHEES update.	Ongoing
25	5 yearly update of LHEES.	2029

Challenges

- Wide range of potential actions and areas, cross-cutting multiple council departments, organisations, groups,
- Technology and legislation will develop over the course of this action plan.

Focus

- Maintain focus on identified LHEES priorities.

Consultation Question 10

Do you agree with the actions identified in Section 14?

Are there other actions that you believe would support LHEES delivery?

15. Consultation Questions

Consultation responses can be submitted [Link] through the portal.

Question 1

- Do you think the priorities identified in Section 3 are in the best interest of the people of South Ayrshire?

Question 2

- Do you think the considerations in focus from Section 4 are appropriate and connect with the overall LHEES priorities?

Question 3

- Do you agree with the challenges and opportunities outlined in Section 6?

- Do the areas of focus in Section 6 reflect a suitable first step for domestic and non-domestic decarbonisation?

Question 4

- Do the identified analysis zones and delivery pathways in Section 7 adequately reflect the social and physical landscape of South Ayrshire?

Question 5

- Do you agree with the areas of focus identified in Section 8 for the technology solutions outlined?

Question 6

- Do you think the areas of focus in Section 9 are suitable and sufficient for approaching heat network development within South Ayrshire?

Question 7

- Do you agree with the focus areas identified in Section 10?

- Are there any other considerations you would like to see used to identify priority areas?

Question 8

- Do you agree with the focus areas identified in Section 11?

- Are there any other considerations you would like to see to develop delivery pathways?

Question 9

- Do you agree with the governance structure outlined in Section 13?

- Are there other established groups that should be considered?

Question 10

- Do you agree with the actions identified in Section 14?

- Are there other actions that you believe would support LHEES delivery?

Appendix A: LHEES Scope, Limitations and Approach

Strategy Scope and Limitations

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

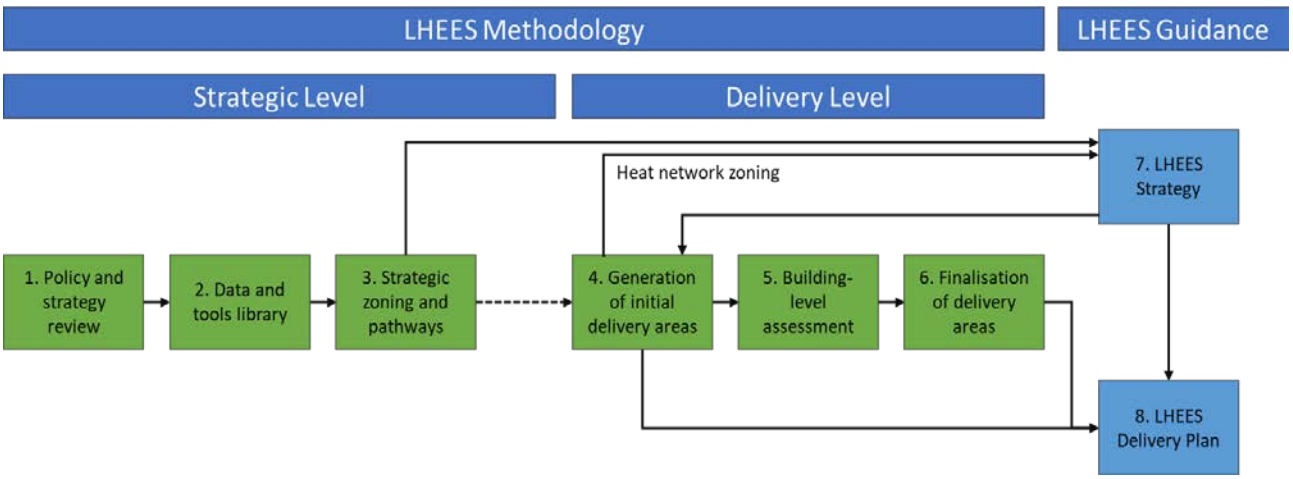
While there are some limitations with the domestic building dataset, which is primarily based on Home Analytics, it is of sufficient quality and reliability to allow detailed analysis and conclusions. However, the non-domestic data, which is primarily based on Non-Domestic Analytics, is less reliable overall due to a dataset that has significantly more gaps in it, and a greater variety of heat uses. For this reason, there are limitations to the level of detail in the outputs from non-domestic buildings.

LHEES Approach

A suggested LHEES methodology is supplied by the Scottish Government as shown in figure 27. Although the approach used is based on the proposed methodology shown below, the details have been adjusted to suit the specific context of South 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 South Ayrshire Council with the data analysis and evidence base to enable development of this Strategy and the accompanying Delivery Plan document. The completion of work carried out in stages 1-4 feeds into the Strategy plan, and the completion of stages 4-6 alongside the Strategy feeds into the Delivery Plan.

Figure 27: Summary of LHEES Approach and Stages



Appendix B: Legislation Relating to LHEES

Table 11: Summary of policy and legislation

UK-Wide
The Climate Change Act 2008 (2050 Target Amendment) Order 2019: Net Zero GHG Emissions by 2050
National – General
Heat in Buildings Strategy (2021) Sets out a pathway to zero emissions buildings by 2045 and includes the New Renewable Heat Target for 2030
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 networked 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 % 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; and • 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 lead partners on Priority Area 1: Supporting a green labour market recovery from Covid-19, and Priority Area 5: Ensuring fairness and inclusion in the skills system as part of a just transition to net zero.
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"

National – Public Sector Specific
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 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).

Appendix C: Heat Pump Suitability Maps

The maps in this appendix highlight, using the methodology described in 7.7.3, which homes are ready for heat pumps today (green), will be ready with modest energy efficiency interventions (orange) and may be more difficult to convert (red).

Figure 28: Heat pump suitability map - Ayr

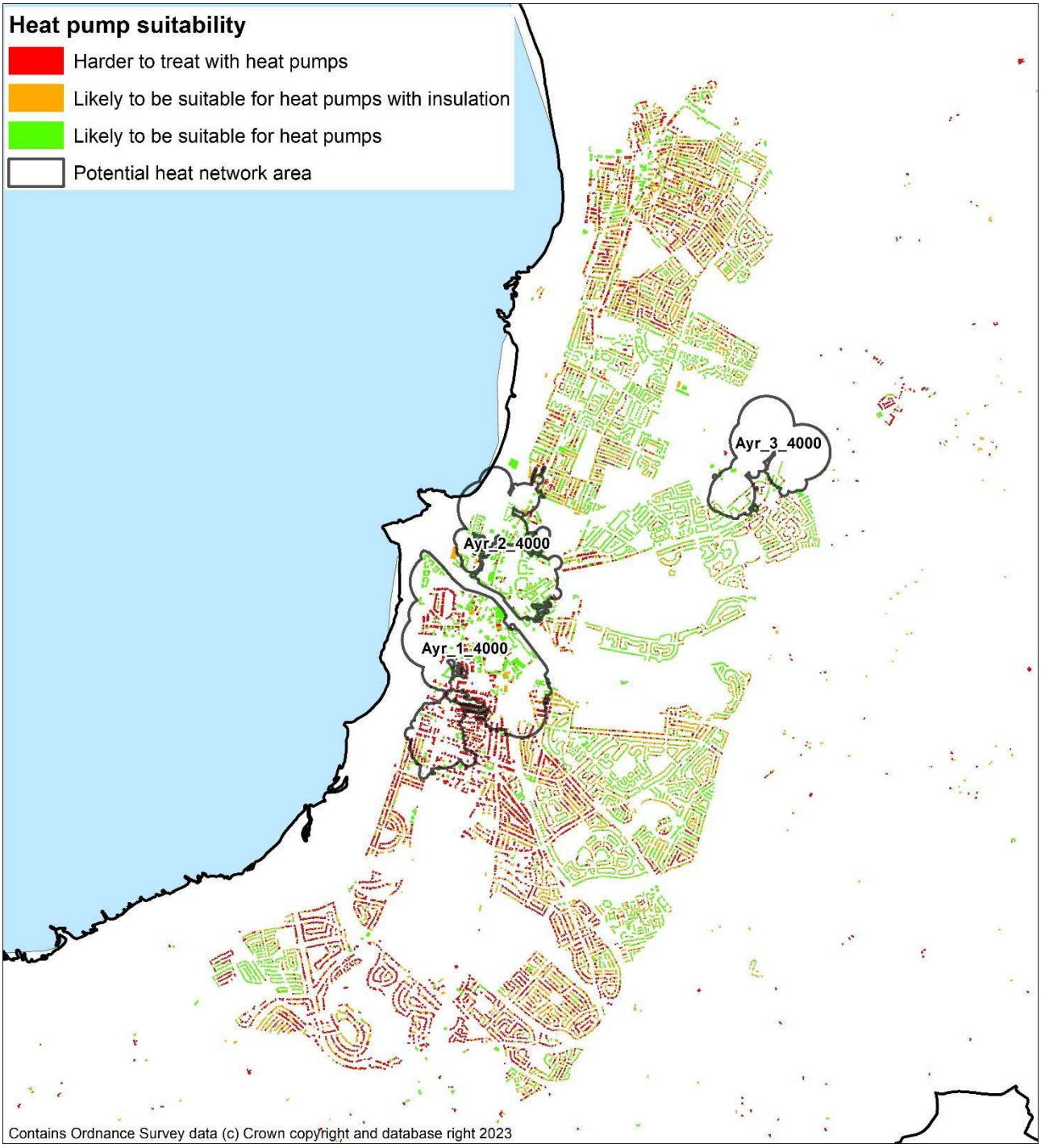


Figure 29: Heat pump suitability map - Girvan

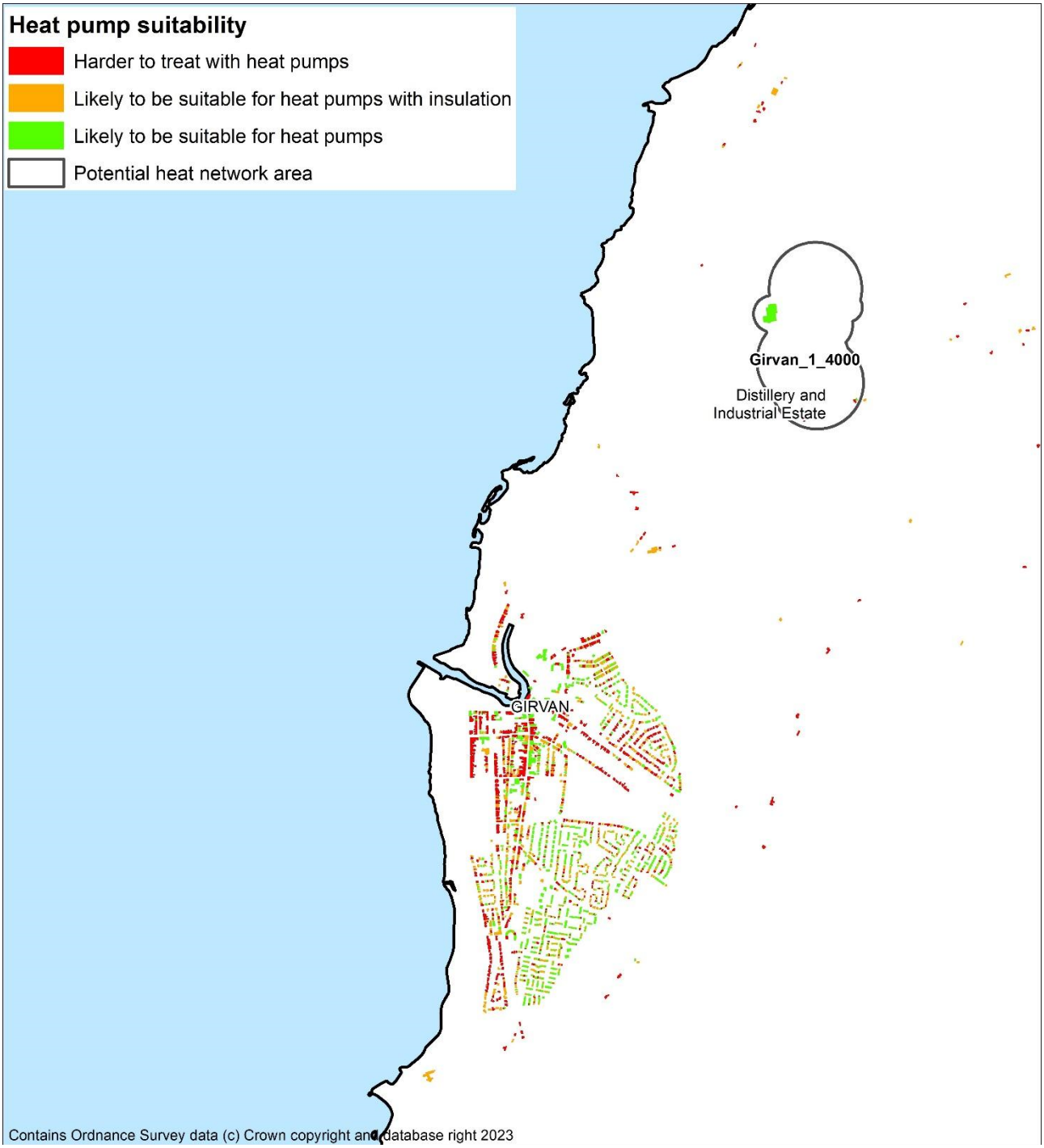


Figure 30: Heat pump suitability map - Troon

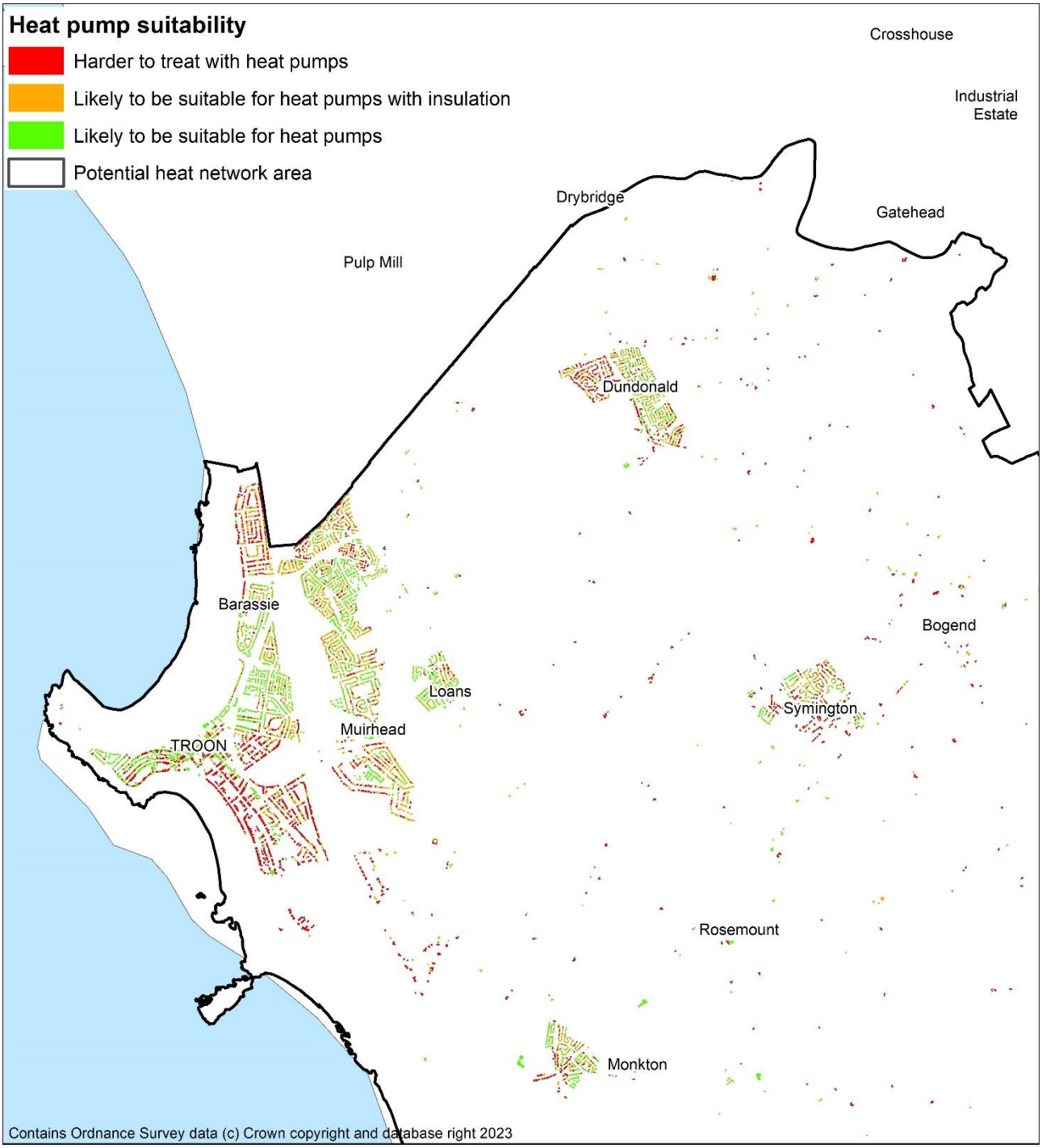


Figure 31: Heat pump suitability map - Maybole

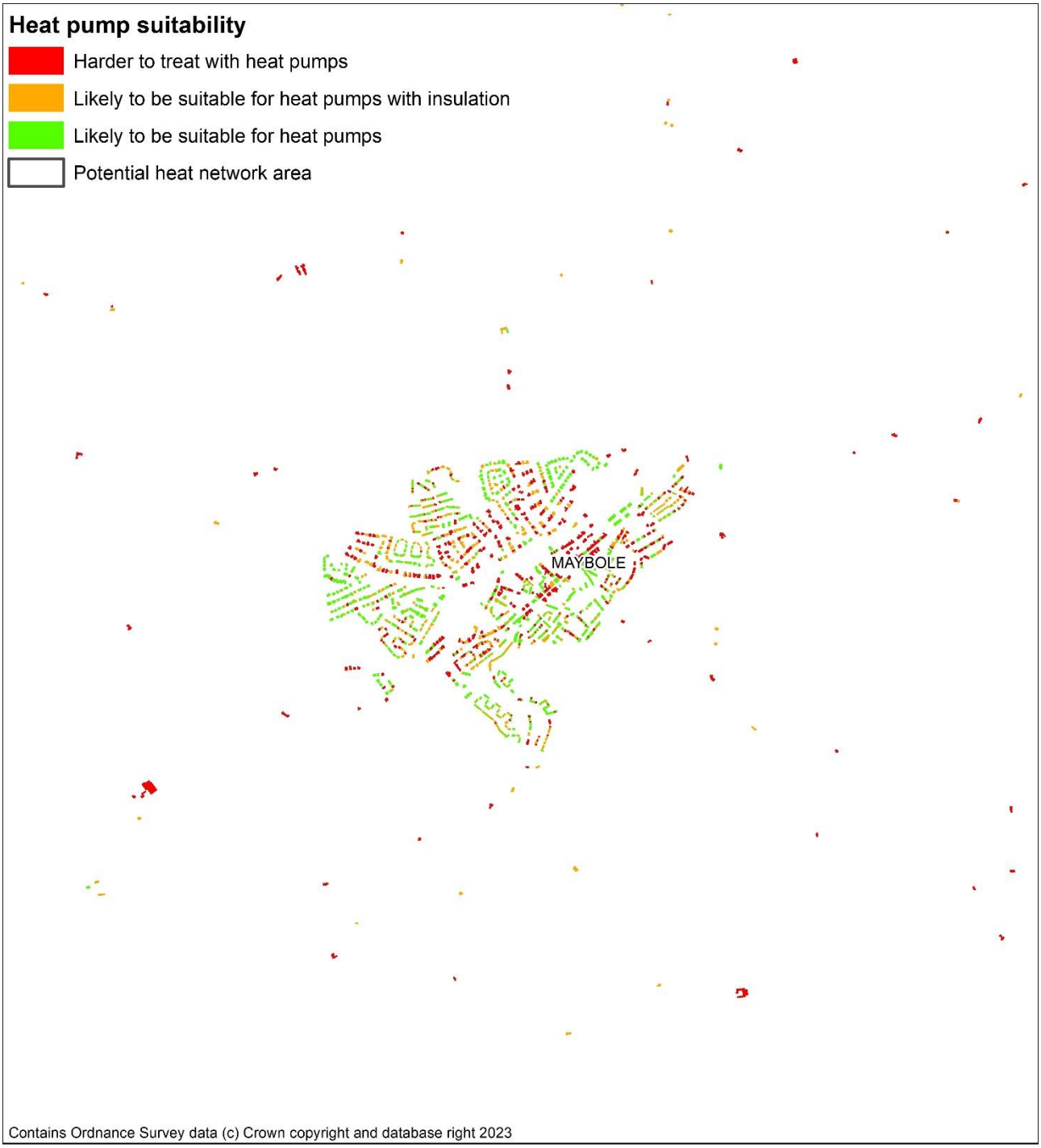


Figure 32: Heat pump suitability map - Ballantrae

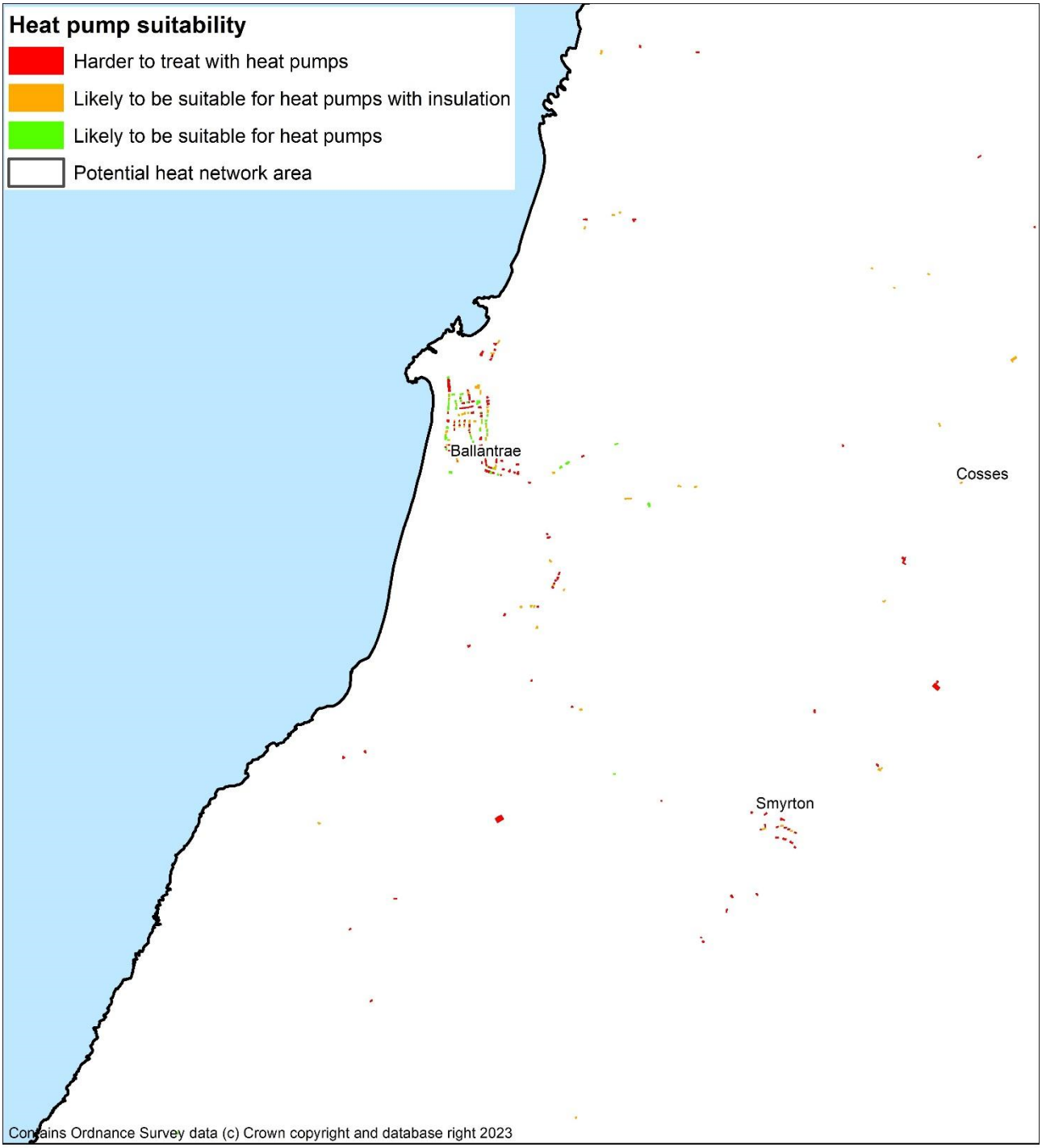


Figure 33: Heat pump suitability map - Dailly

Appendix 3

south AYRSHIRE COUNCIL
Comhairle Siorrachd Àir a Deas
Making a Difference Every Day

South Ayrshire Council
Equality Impact Assessment
Scoping Template

Equality Impact Assessment is a legal requirement under the Public Sector Duty to promote equality of the Equality Act 2010. Separate guidance has been developed on Equality Impact Assessment's which will guide you through the process and is available to view here: https://www.south-ayrshire.gov.uk/equalities/impact-assessment.aspx

Further guidance is available here: https://www.equalityhumanrights.com/en/publication-download/assessing-impact-and-public-sector-equality-duty-guide-public-authorities/

The Fairer Scotland Duty ('the Duty'), Part 1 of the Equality Act 2010, came into force in Scotland from 1 April 2018. It places a legal responsibility on Councils to actively consider ('pay due regard to') how we can reduce inequalities of outcome caused by socio-economic disadvantage, when making strategic decisions. FSD Guidance for Public Bodies in respect of the Duty, was published by the Scottish Government in March 2018 and revised in October 2021. See information here: https://www.gov.scot/publications/fairer-scotland-duty-guidance-public-bodies/

1. Policy details

Policy Title	Local Heat and Energy Efficiency Strategy
Lead Officer (Name/Position/Email)	Robin Jamieson Coordinator Asset Management

2. Which communities, groups of people, employees or thematic groups do you think will be, or potentially could be, impacted upon by the implementation of this policy? Please indicate whether these would be positive or negative impacts

Community or Groups of People	Negative Impacts	Positive impacts
Age – men and women, girls & boys	-	-
Disability	-	-
Gender Reassignment (Trans/Transgender Identity)	-	-
Marriage or Civil Partnership	-	-
Pregnancy and Maternity	-	-
Race – people from different racial groups, (BME) ethnic minorities and Gypsy/Travellers	-	-
Religion or Belief (including lack of belief)	-	-

Community or Groups of People	Negative Impacts	Positive impacts
Sex – (issues specific to women & men or girls & boys)	-	-
Sexual Orientation – person's sexual orientation i.e. LGBT+, lesbian, gay, bi-sexual, heterosexual/straight	-	-
Thematic Groups: Health, Human Rights & Children's Rights	-	-

3. What likely impact will this policy have on people experiencing different kinds of social disadvantage i.e. The Fairer Scotland Duty (This section to be completed for any Strategic Decisions). Consideration must be given particularly to children and families.

Socio-Economic Disadvantage	Negative Impacts	Positive impacts
Low Income/Income Poverty – cannot afford to maintain regular payments such as bills, food, clothing	-	LHEES seeks to reduce fuel poverty thus improving household finances
Low and/or no wealth – enough money to meet Basic living costs and pay bills but have no savings to deal with any unexpected spends and no provision for the future	-	LHEES seeks to reduce fuel poverty thus improving household finances
Material Deprivation – being unable to access basic goods and services i.e. financial products like life insurance, repair/replace broken electrical goods, warm home, leisure/hobbies	-	LHEES seeks to reduce fuel poverty thus improving household finances
Area Deprivation – where you live (rural areas), where you work (accessibility of transport)	-	LHEES seeks to reduce fuel poverty thus improving household finances
Socio-economic Background – social class i.e. parent's education, employment and income	-	LHEES seeks to reduce fuel poverty thus improving household finances

4. Do you have evidence or reason to believe that the policy will support the Council to:

General Duty and other Equality Themes Consider the 'Three Key Needs' of the Equality Duty	Level of Negative and/or Positive Impact (High, Medium or Low)
Eliminate unlawful discrimination, **harassment and victimisation**	Low

General Duty and other Equality Themes Consider the 'Three Key Needs' of the Equality Duty	Level of Negative and/or Positive Impact (High, Medium or Low)
Advance equality of opportunity between people who share a protected characteristic and those who do not	Low
Foster good relations between people who share a protected characteristic and those who do not. (Does it tackle prejudice and promote a better understanding of equality issues?)	Low
Increase participation of particular communities or groups in public life	Low
Improve the health and wellbeing of particular communities or groups	Low
Promote the human rights of particular communities or groups	Low
Tackle deprivation faced by particular communities or groups	Low

5. Summary Assessment

Is a full Equality Impact Assessment required? (A full Equality Impact Assessment must be carried out if impacts identified as **Medium and/or High**)	~~**YES**~~ **NO**
Rationale for decision: **This report advises the Cabinet of 16th January 2024. Members' decision on this has no specific equality implications**	
Signed : Tom Burns **Service Lead** **Date:** 08.01.2023	