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Title | Sustenic Dwelling Level Stock Profiles with Low Carbon Heat Ready and Hard to Decarbonise indicators - Harrogate

Sustenic Local Government Services

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Headline Results

Energy Efficiency

The average energy efficiency rating for dwellings in Harrogate is 62, 4 points poorer than the average for England (66)

The implications of Harrogate's lower energy efficiency rating are that its dwellings are using more energy than the average for England, resulting in higher energy costs and greater environmental impact (for details see *Energy Efficiency*).

Dwelling Characteristics

Harrogate has a higher proportion of older stock than found nationally, as well as a higher proportion of energy inefficient house types (detached and bungalows).
The higher levels of older stock and energy inefficient house types impact the retrofit measures which can be applied and the cost of retrofit are often higher for these types of dwellings compared to newer, smaller dwelling types.

Owner occupancy is higher and social stock lower in Harrogate compared to the national position.

Improving energy efficiency in Harrogate will require targeted initiatives to incentivize homeowners to upgrade their properties (for details see *Dwelling Characteristics*).

Energy Efficiency Improvements

Harrogate has 49,104 (63%) dwellings which are below Band C. Of these, 24,320 of their lofts still require improved insulation and 11,082 require improved glazing. Wall insulation is more complex with 8,636 cavity walls still requiring insulation as well as 11,638 stone walls that are uninsulated.
These are just a few of the indicators of the extensive work needed to bring dwellings in Harrogate up to energy efficiency standards necessary to achieve decarbonisation (for details see *Energy Efficiency Improvements*).

Low Carbon Heat Ready

In Harrogate there are 19,384 (25%) dwellings have all four fabric first measures (loft insulation, double/triple glazing, wall insulation and floor insulation) and are therefore potentially Low Carbon Heat Ready (for example, ready for an air source heat pump). 58,911 (75%) dwellings are missing one or more of the fabric first measures.

The implications of this are that the majority of dwellings in Harrogate may require retrofitting before a low carbon heating system can be effective in terms of energy costs and effectively reduce carbon emissions from the residential sector (for details see *Low Carbon Heat Ready*).

Hard to Decarbonise

In Harrogate 19,001 dwellings are within conservation areas and 1,399 dwellings were identified as Grade II listed. Furthermore, 19,440 have stone or solid walls which are uninsulated and there are 786 rooms in roofs which need insulation. Both of these features are considered hard to treat with remedial measures.

The implications of dwellings in conservation areas, that are Grade II listed and have hard to treat features are that retrofitting them can be more expensive and take longer, as well as having to comply with strict regulations (for details see *Hard to Decarbonise*).

Retrofit Costs

In Harrogate £1,250 million of funding is required to retrofit Fabric First measures where these are not already present. To decarbonise the heating of the stock a further £1,093 million would be required to install heat pumps, storage heaters and/or solar PV where possible.

Retrofitting 14,619 dwellings in conservation areas in Harrogate with Fabric First measures would require funding levels of around £616 million. This figure is only just below the £634 million funding needed for the 44,292 dwellings not in conservation areas in Harrogate. (for details see

Executive summary

This report provides a dwelling level analysis of the housing stock based on open data sources with a particular focus on energy efficiency and specifically addresses the provision of information on the stock that could be considered low carbon heat ready or hard to decarbonise. The Ordnance Survey (OS) AddressBase dataset provides a full address list of residential dwellings in Harrogate, as well as the spatial location of the dwellings. OS MasterMap provides the geographical location, footprints and dimensions for each building as well as surrounding features. These datasets have been used to provide additional spatial analysis where required.

The report is set in the context of the UK's legally binding target to bring greenhouse gas emissions to net zero by 2050 and many policy documents and initiatives associated with or arising from this. It identifies the Home Upgrade Grant scheme is the current main funding opportunity for which the Council can bid.

In January 2023, the York and North Yorkshire Local Enterprise Partnership on behalf of North Yorkshire County Council, funded through the North Yorkshire Shared Prosperity Fund commissioned the Sustenic Dwelling Level Stock Profiles for Craven, Hambleton, Harrogate, Ryedale and Selby to provide further detail and analysis of the housing stock, as achieved by the Hitting Hard project in Scarborough and Richmondshire[1]. The information supplied in these reports forms the basis of a decarbonisation plan and can support any future bid to support housing retrofit in North Yorkshire.

The data provided and summarised in this report are the Sustenic Dwelling Level Stock Profiles. The Sustenic Dwelling Level Stock Profiles have been developed to allow local authority officers to gain vital insights into the housing stock for their area, by using open data made available on energy efficiency, dwelling and household characteristics. Where this information is not complete for all dwellings within an area, Sustenic have developed a methodology which maximizes the use of the detailed dwelling level data, while also using the higher level information to ensure the outputs are representative and valid for all dwellings.

The main source of dwelling level information used to create the Sustenic Dwelling Level Stock Profiles is the Energy Performance of Buildings Data: England and Wales, Domestic Energy Performance Certificate (EPC) dataset[2]. For Harrogate the dataset used for this project includes records up to 30 September 2022.

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[1] Hitting Hard Action plan summary complete govt logo-1.pdf (ynylep.com)
[2] Energy Performance of Buildings Data England and Wales (opendatacommunities.org)

This EPC dataset for Harrogate had lodgments for 49,554 dwellings. Where a dwelling had more than one lodgment, the most recent record for that dwelling was used. This dataset therefore provided survey data for 66% of the 74,934[3] dwellings in Harrogate.. For the remaining 34% of dwellings, small area data analysis is used to maximize the use of the detailed dwelling level data, while also using higher level information to ensure the outputs are representative and valid for all dwellings.

Using the OS AddressBase dataset, 78,295 residential dwellings were identified. This is higher than the Table 100 figure of 74,934.

The EPC data was merged with the OS AddressBase dataset using the UPRN (Unique Property Reference Number). 46,510 of the EPC records were successfully matched to the OS AddressBase data. Therefore the EPC data covers 59% of the 78,295 dwelling identified in Harrogate.

Key results

The average energy efficiency rating[4] for dwellings in Harrogate is 63, 3 points poorer than the average for England (66). 63% of dwellings (49,104) in Harrogate are below an EPC Band C, the bands at which the HUG funding scheme is directed. 17,000 (22%) dwellings in Harrogate are in EPC Bands E, F and G, which are the least energy efficient. This is higher than the proportion of dwellings with an EPC Band E, F and G in England (11%).

The EPCs identify potential to improve the average energy efficiency score to 79 but this would still leave 12% of the stock below an EPC Band C. These estimates of potential energy efficiency must be treated with considerable caution for reasons discussed in the report but are a useful first step in identifying potential for improvement.

Dwelling age, type and tenure profiles help better understand the poorer energy efficiency of the Harrogate housing stock. Harrogate has more energy inefficient house types (detached and bungalows) and fewer flats compared the national proportions. Harrogate has a higher percentage of owner-occupiers (71%) than England (65%) and the difference is made up by a lower level of social rented housing (14% compared to 17% nationally). Private sector stock generally performs worse in term of energy efficiency than social rented stock further helping to understand the poorer overall performance of the Harrogate stock. Tables summarising these data by ward and division are provided and colour and symbol coded to make them easier to assimilate. Masham & Kirkby Malzeard and Washburn wards stand out as having low average energy ratings associated with the predisposing factors of dwelling age, type and tenure that are associated with such ratings.

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[3] Live tables on dwelling stock (including vacants) - GOV.UK (www.gov.uk)

[4] Based on the EPC SAP rating (Standard Assessment Procedure - GOV.UK (www.gov.uk))

In Harrogate, 13,347 (17%) of dwellings were built before 1900, with a further 17,015 (22%) built between 1900 and 1949. Dwellings built before 1950 are more likely to be solid wall dwellings which are generally less energy efficient than cavity wall equivalents[5]. Harrogate has 26,541 (34%) dwellings which were built between 1950 and 1990.

Harrogate has 21,392 (27%) dwellings which are more modern as these have been built since 1990. These dwellings are generally expected to have higher levels of energy efficiency as the more recent building regulations require higher standards of insulation compared to previous standards.

Dwellings with EPCs less than Band C have been mapped by census output area (COA) and show a marked rural distribution notably Masham & Kirkby Malzeard, Pateley Bridge & Nidderdale Moors and Washburn wards. There are, however, also COAs within urban areas of Harrogate and Knaresborough within this range (78% or higher).

Percentage of dwellings with an EPC Band below Band C at COA level in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
Contains OS data © Crown copyright and database right 2017
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[5] Cavity wall construction became prevalent in some areas of the country, notably coastal areas, as early as the 1870s but outside of these areas was mainly introduced during the 1930s suburban building boom.

A detailed breakdown of possible energy efficiency improvements to sub Band C dwellings reveal 50% (24,320) of their lofts still require improved insulation and 23% (11,082) improved glazing. Wall insulation was more complex with 31% (8,636) of cavity walls still requiring insulation but the standout statistic is very clearly the 89% (11,638) of solid walls that are uninsulated.

Heating systems in sub Band C dwellings were rated average to very poor in 27% of cases generally but in dwellings off the gas network this rose to 86%.

When these various data are summarised by ward it is the Harrogate Bilton Grange and Harrogate Central wards and some of the rural wards that emerge as facing the greatest challenges. The table below summarises the position both numerically and with a simple traffic light and graphic system.

Energy Efficiency retrofit measures required for dwelling below EPC Band C by Ward in Harrogate (before April 2023) (page 1 of 3)

Ward	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Bishop Monkton & Newby	51%	1,063	395	228	202	95	265	389	199
Boroughbridge	46%	929	454	191	130	11	265	210	18
Claro	70%	1,257	508	310	223	285	220	644	342
Fountains & Ripley	73%	1,449	639	458	173	578	164	1,013	533
Harrogate Bilton Grange	81%	1,546	946	177	390	394	126	94	0
Harrogate Bilton Woodfield	61%	1,275	657	119	254	240	283	134	4
Harrogate Central	57%	1,642	641	602	156	959	209	469	67
Harrogate Coppice Valley	69%	1,489	781	503	203	760	245	223	17
Harrogate Duchy	60%	905	330	340	202	278	103	191	37
Harrogate Fairfax	63%	1,329	804	221	359	176	308	139	2
Harrogate Harlow	63%	1,092	654	205	348	191	45	76	0
Harrogate High Harrogate	64%	1,376	651	396	110	821	238	220	17
Harrogate Hookstone	61%	952	536	110	321	47	45	97	0
Harrogate Kingsley	52%	1,109	637	217	359	143	116	145	27
Harrogate New Park	53%	1,058	596	76	305	267	78	213	52
Harrogate Oatlands	76%	1,368	802	268	474	190	263	118	1
Harrogate Old Bilton	70%	1,083	606	98	292	71	22	103	0

Energy Efficiency retrofit measures required for dwelling below EPC Band C by Ward in Harrogate (before April 2023) (page 2 of 3)

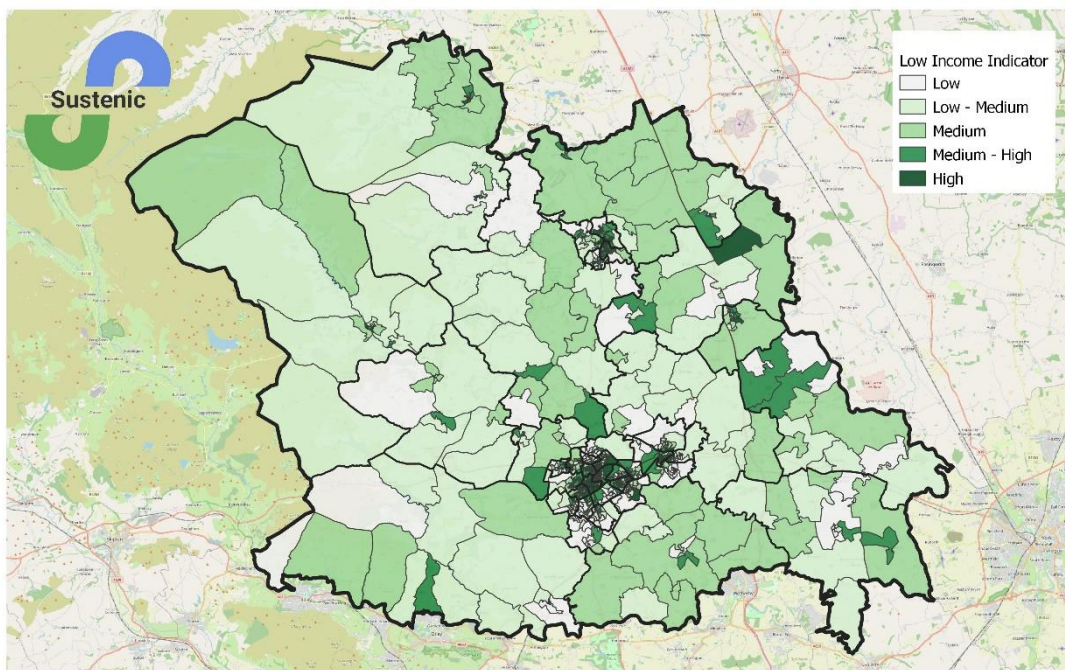| Ward	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Harrogate Pannal	62%	1,012	502	183	504	141	29	77	9
Harrogate Saltergate	49%	1,042	566	59	269	0	16	154	0
Harrogate St Georges	56%	1,138	522	453	231	385	121	63	2
Harrogate Starbeck	69%	1,171	692	118	295	109	359	116	0
Harrogate Stray	73%	1,507	818	504	533	303	163	113	0
Harrogate Valley Gardens	64%	1,568	561	754	200	919	238	386	112
Killinghall & Hampsthwaite	41%	828	432	124	223	216	8	110	30
Knaresborough Aspin & Calcutt	68%	1,223	681	201	317	127	110	144	4
Knaresborough Castle	61%	1,331	699	396	302	247	239	192	4
Knaresborough Eastfield	59%	1,023	550	103	369	14	57	167	5
Knaresborough Scriven Park	52%	1,023	608	212	334	112	103	125	2
Marston Moor	63%	1,229	544	217	171	25	353	704	377
Masham & Kirkby Malzeard	79%	1,364	616	392	145	730	45	906	537
Nidd Valley	69%	1,370	661	280	286	620	39	641	308
Ouseburn	73%	1,377	510	281	162	35	385	1,178	752
Pateley Bridge & Nidderdale Moors	74%	1,434	702	408	149	821	28	664	312
Ripon Minster	52%	1,058	606	245	211	41	382	159	9
Ripon Moorside	58%	1,090	585	83	308	2	66	107	0

Energy Efficiency retrofit measures required for dwelling below EPC Band C by Ward in Harrogate (before April 2023) (page 3 of 3)

Ward	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Ripon Spa	△ 59%	△ 1,210	△ 562	● 306	● 197	● 26	△ 356	173	0
Ripon Ure Bank	● 54%	● 1,082	△ 578	△ 357	● 152	● 21	△ 512	194	26
Spofforth with Lower Wharfedale	◆ 69%	△ 1,192	△ 530	● 285	● 226	△ 524	● 43	531	247
Washburn	◆ 78%	◆ 1,528	△ 612	● 313	● 311	◆ 656	● 43	1,184	689
Wathvale	△ 67%	◆ 1,382	△ 540	● 289	● 181	● 191	● 311	862	491

Source: Sustenic Dwelling Level Stock Profiles 2023

To complement the energy efficiency data, indicators of dwelling condition and low household income were developed by the Sustenic team. The dwelling condition indicator is expected to be useful when identifying areas where condition may be a barrier to implementing energy efficiency measures. The low income indicator has a much more immediate use in identifying areas where larger numbers of households are expected to meet the low income criterion for the Home Upgrade Grant (HUG) funding scheme[6]. The map below illustrates the distribution of the low income ranges with the darker colours indicating areas where the largest number of households on low incomes are likely to be found.

Low Income indicator at COA level for Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
Contains OS data © Crown copyright and database right 2017
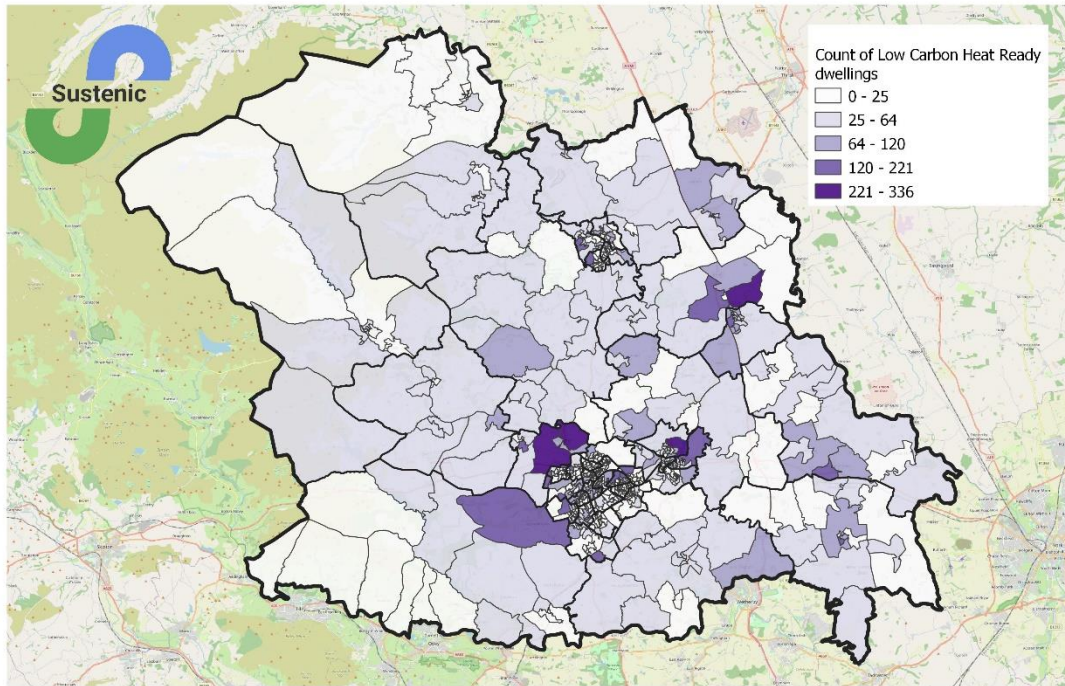© OpenStreetMap contributors

Low Carbon Heat Ready

To be able to meet the net zero targets set by Government, low carbon heating systems which currently very much focus on heat pumps will need to be installed on a very large scale. For these to operate effectively and efficiently, homes need to be well insulated. The report focusses on the extent to which four specific measures are present in the stock i.e. loft, wall and floor insulation and double/triple glazing and the extent to which these are present both singly and in combination with other measures. Where all four measures are present then the dwelling is considered more likely to be low carbon heat ready i.e. ready for a low carbon heat system such as a heat pump to be installed. Only 25% of the stock had all four of these basic

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[6] Low income households are defined as households with an annual income below £31,000

measures and so could be considered likely to be low carbon heat ready. The map below illustrates where these dwellings are found.

Count of dwellings which are potentially Low Carbon Heat Ready at COA level in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
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Insulating floors is a particularly disruptive measure and it may be that if a dwelling is sufficiently energy efficient such work is unnecessary before installing a low carbon heat source. If this approach were taken across Harrogate then 42% of dwellings would be considered ready for a low carbon heat source.

A final very simple package of basic measures comprising dwellings with loft insulation and double/triple glazing was considered and 56% met this criterion. This sort of approach might be successful in mid terraced stock or flats where heat losses are lower.

Hard to Decarbonise

The report also considers housing stock which is 'hard to decarbonise' as defined by the CCC[7]. Some of the factors identified by the CCC could be identified from the available data. The main physical items identified are the prevalence of hard to treat walls with 29% of the stock with solid or stone walls. For dwellings with a room in the roof, these can be hard to treat as loft insulation would be required beneath the plaster between the rafters. 798 dwellings in Harrogate were identified as having rooms in the roof and requiring loft insulation.

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[7] Analysis on abating direct emissions from 'hard-to-decarbonise' homes (Element Energy & UCL) - Climate Change Committee (theccc.org.uk)

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Heritage considerations are also identified as a potential barrier to decarbonisation with 1,426 dwellings in listed buildings where only the most limited of measures are likely to be permitted. In addition 19,001 (24%) dwellings are within conservation areas which are likely to face additional restrictions including not allowing external wall insulation.

Retrofit Costs

By understanding the costs associated with retrofitting, local authorities can make informed decisions about which retrofitting measures to prioritise, as well as which funding and resources are suitable to complete the retrofitting.

A retrofit cost model has been developed drawing upon national sources of evidence, to assign costs to the common retrofit measures of interest.

By using the various cost assumptions made by Climate Change Committee's (CCC) Sixth Carbon Budget, this has been expanded sufficiently to develop a simple cost model which can be used at an individual dwelling and a whole stock level.

There are three sets of possible retrofit packages which have been modelled. Each measure, and therefore the associated cost, is only applied where applicable for each dwelling. These are:

1. Fabric First – includes wall insulation, floor insulation, loft insulation and window upgrades
2. Basic Measures - removes the more difficult and more costly measures (wall and floor insulation) and focuses on the basic fabric measures (roof and windows)
3. Decarbonisation – includes Fabric First cost and costs of a heat pump or storage heaters and costs of Solar PV

The table below shows that to retrofit dwellings in Harrogate requiring Fabric First measures would require funding levels of around £1,250 million. For 24,138 (41%) of these dwellings, the cost of retrofit would be below £10,000 per dwelling. The cost to retrofit these dwellings would be around £155 million. For 4,880 (8%) of these dwellings the cost of retrofit would be above £50,000 per dwelling. The cost to retrofit these dwellings would be around £376 million.

Number, percentage and costs for dwellings in Harrogate requiring one or more of the Fabric First measure by banded retrofit costs

Fabric First Costs	Number of Dwellings	Per cent of Dwellings	Cost
Below £5,000	7,396	13%	£23 million
£5,000 to £10,000	16,742	28%	£132 million
£10,000 to £25,000	18,093	31%	£290 million
£25,000 to £50,000	11,800	20%	£429 million
Above £50,000	4,880	8%	£376 million
All Dwellings	**58,911**	**-**	**£1,250 million**

Source: Sustenic Dwelling Level Stock Profiles 2023

Conclusions and Recommendations

The Sustenic Dwelling Level Stock Profiles results provided within this report, as well as the dataset provided to Harrogate, indicate that the current energy efficiency levels in Harrogate are lower than for the average for England.

These results suggest that more retrofit improvement is required in Harrogate to bring dwellings up to a minimum of an EPC Band C by 2030 than is found nationally.

The high proportion of solid and stone wall stock also suggests that the cost of retrofitting these dwellings will be higher than average. This is in large part due to the significant proportion requiring external or internal wall insulation, which is generally more expensive compared to cavity wall insulation.

The low proportion of social dwellings in Harrogate suggests that proportionally fewer dwellings will be able to benefit from funding from social housing funding streams such as the Social Housing Decarbonisation Fund (SHDF) and therefore, a higher proportion of retrofit measures will need to be funded through HUG or the homeowner or private landlord.

The Sustenic Dwelling Level Stock Profiles within this report provide results down to dwelling level to provide detailed information, using open source data. These can be used to begin the development of an action plan for retrofit needs across the region.

The retrofit costs provided in this report and accompanying dataset can help facilitate cost modelling scenarios to better inform bids for funding and future planning towards net zero.

With the York & North Yorkshire's Routemap to Carbon Negative plan to deliver net zero by 2034 and carbon negative by 2040[8], significant investment in staff will almost certainly be necessary if only to ensure that the region is actively pursuing and securing all possible sources of funding. This report does, however, provide a useful information platform from which to launch such bids.

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[8] [York & North Yorkshire's Routemap to Carbon Negative 040123.pdf (ynylep.com)](ynylep.com)

Contents

Introduction

For local authorities, understanding the physical characteristics, energy efficiency and condition of the stock in their area is critical to developing or updating housing and energy strategies. Whether looking at housing conditions, reducing fuel poverty or retrofitting homes to reach net zero, an understanding of the current position is an essential prerequisite to strategy development, effective planning and budgeting necessary to successfully develop and implement work packages.

In January 2023, the York and North Yorkshire Local Enterprise Partnership on behalf of North Yorkshire County Council, funded through the North Yorkshire Shared Prosperity Fund commissioned the Sustenic Dwelling Level Stock Profiles for Craven, Hambleton, Harrogate, Ryedale and Selby to provide further detail and analysis of the housing stock, as achieved by the Hitting Hard project in Scarborough and Richmondshire[9]. The information supplied in these reports forms the basis of a decarbonisation plan and can support any future bid to support housing retrofit in North Yorkshire.

This report uses open housing and energy efficiency data to deliver the Sustenic Dwelling Level Stock Profiles, which provide a picture of the current stock within the authority to support strategy development.

The material in the report can also be used as a ready source of information to support funding bids, which are often time critical and more generally as an evidence base to inform Council decision making.

Background

The UK was the first major economy to create a legally binding target to bring greenhouse gas emissions to net zero by 2050[10]. The 'Net Zero Strategy: Build Back Greener'[1] was published in October 2021 by the Department for Business, Energy & Industry Strategy (BEIS). This strategy set out the reasons why the UK needs to end its domestic contribution to climate change as well as the desire for 'Levelling Up' the country.

The strategy covers seven areas where action is needed to move the UK towards net-zero. These are; Power, Fuel Supply and Hydrogen, Industry, Heat and Buildings, Transport, Natural Resources, Waste and F-Gases, and Greenhouse Gas Removal.

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[9] Hitting Hard Action plan summary complete govt logo-1.pdf (ynylep.com)
[10] net-zero-strategy-beis.pdf (publishing.service.gov.uk)

Policies for residential dwellings come within the Heat and Building section of the strategy development. Heating for homes and workspaces makes up almost a third of all UK carbon emissions[1].

For heat and buildings the key policies committed to within this strategy are:

➢ An ambition that by 2035, no new gas boilers will be sold.
➢ A new £450 million three-year Boiler Upgrade Scheme which will see households offered grants of up to £5,000 for low-carbon heating systems so they cost the same as a gas boiler now.
➢ A new £60 million Heat Pump Ready programme that will provide funding for pioneering heat pump technologies and will support the government's target of 600,000 installations a year by 2028.
➢ Delivering cheaper electricity by rebalancing of policy costs from electricity bills to gas bills this decade.
➢ Further funding for the Social Housing Decarbonisation Scheme and Home Upgrade Grants, investing £1.75 billion. Additional funding of £1.425 billion for Public Sector Decarbonisation, with the aim of reducing emissions from public sector buildings by 75% by 2037.
➢ Launching a Hydrogen Village trial to inform a decision on the role of hydrogen in the heating system by 2026

A second publication by BEIS the 'Heat and Building Strategy'[11] also published in October 2021, provides greater detail of the policies and funding streams which have been made available to improve the energy efficiency of homes, as well as those expected in future. Some of the funding is open to householders to apply for grants including the Boiler Upgrade Scheme. Initially this also included the Green Homes Grant Voucher scheme but this was closed at the end of March 2021. Other funding was made available for local authorities to bid for including the following schemes; Local Authority Delivery (LAD), Home Upgrade Grant (HUG) and Social Housing Decarbonisation Fund (SHDF).

The LAD scheme aims to raise the energy efficiency of low income (originally combined household income less than £30,000) and low energy performance homes with a focus on energy performance certificate (EPC ratings of E, F or G).

Phase 2 of the LAD Scheme allocated £300 million between 5 Local Net Zero Hubs, who are regional points of expertise and coordination on energy issues. The North East and Yorkshire Net Zero (NEYNZ) hub was allocated £53.2 million of this funding[12]. The NEYNZ hub reports 2,000 dwellings across the region have benefitted from low carbon measures via this scheme.[13]

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[11] Heat and Buildings Strategy (publishing.service.gov.uk)
[12] Green Homes Grant Local Authority Delivery scheme, Phase 2: funding allocated to Local Net Zero Hubs
[13] Local Authority Led Housing Retrofit

Harrogate was part of a successful consortium led by City of York Council which was allocated £2.38 million in phase 3 of the LAD scheme and £498k in phase 1 of the HUG scheme in August 2021. This was part of the Sustainable Warmth Competition which combined LAD phase 3 with the HUG phase 1[14].

The focus of LAD phase 3 was to support low-income households living in on-gas grid homes only. Off gas grid homes were to be addressed by HUG.

As a minimum, EPC band F-G homes should be upgraded to D or above and band D-E homes to C or above to meet statutory fuel poverty targets of EPC band C by 2030 and the interim milestone of band D by 2025.

Phase 2 of the HUG (HUG2) was open to Local Authority applications until 27th January 2023 and is expected to be delivered from early 2023 to March 2025. A bid was put forward by North Yorkshire County Council for HUG2, the result of which is pending at the time of this report.   As with previous schemes, private sector landlords with tenants who meet the eligibility criteria are required to contribute one third of the costs. The Sustenic Dwelling Level Stock Profiles have been tailored to provide information that can help identify the HUG2 scheme is likely to be appropriate.

Throughout this report, results from the Sustenic Dwelling Level Stock Profiles for Harrogate will also be compared to national figures from the English Housing Survey (EHS).   The comparisons will show how the housing stock in Harrogate compares to the national picture and highlight areas which may require higher levels of funding to allow the housing stock to meet the target of bringing greenhouse gas emissions to net zero by 2050.
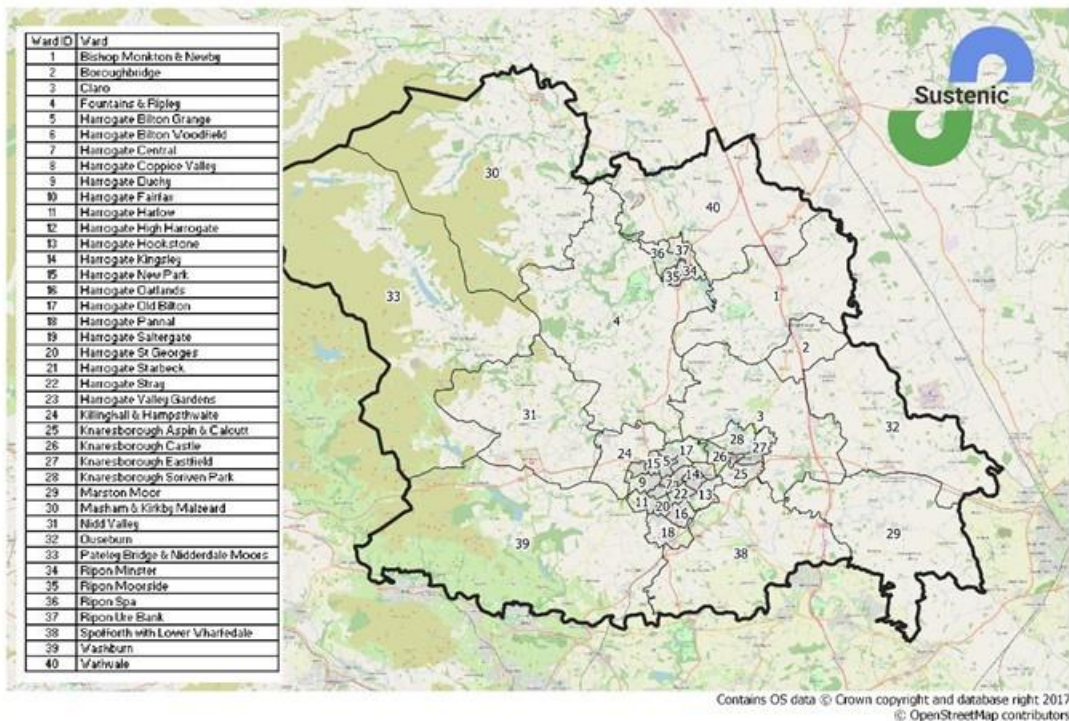
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[14] [Sustainable Warmth Competition - successful local authorities - GOV.UK (www.gov.uk)](www.gov.uk)

Harrogate (Harrogate Borough Council before April 2023)

Harrogate Borough Council is in the Government Office Region of Yorkshire and the Humber. The population in Harrogate is estimated at 162,700[15]. 66%[16] of the population are classed as living in Urban areas compared to 44% of the population which are living in areas classed as Rural or Market towns. There are an estimated 74,934[17] dwellings in Harrogate.

Until April 2023, Harrogate was made up of 40 wards. Map 1 shows the local authority boundary and the wards within Harrogate.

Map 1: Wards in Harrogate

Ward ID	Ward
1	Bishop Monkton & Newby
2	Boroughbridge
3	Claro
4	Fountains & Ripley
5	Harrogate Bilton Grange
6	Harrogate Bilton Woodfield
7	Harrogate Central
8	Harrogate Coppice Valley
9	Harrogate Duchy
10	Harrogate Fairfax
11	Harrogate Harlow
12	Harrogate High Harrogate
13	Harrogate Hookstone
14	Harrogate Kingsley
15	Harrogate New Park
16	Harrogate Oatlands
17	Harrogate Old Bilton
18	Harrogate Pannal
19	Harrogate Saltergate
20	Harrogate St Georges
21	Harrogate Starbeck
22	Harrogate Stray
23	Harrogate Valley Gardens
24	Killinghall & Hampsthwaite
25	Knaresborough Aspin & Calcutt
26	Knaresborough Castle
27	Knaresborough Eastfield
28	Knaresborough Scriven Park
29	Marston Moor
30	Masham & Kirkby Malzeard
31	Nidd Valley
32	Ouseburn
33	Pateley Bridge & Nidderdale Moors
34	Ripon Minster
35	Ripon Moorside
36	Ripon Spa
37	Ripon Ure Bank
38	Spofforth with Lower Wharfedale
39	Washburn
40	Wathvale

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From April 2023, these wards will be replaced with 21 divisions which will form part of the new North Yorkshire Council. North Yorkshire Council will become a single council for everyone in North Yorkshire, replacing the county council and the seven district and borough councils[18]. These included Craven, Hambleton, Richmondshire, Ryedale and Selby District Councils; and Harrogate and Scarborough Borough Councils.

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[15] Population and household estimates, England and Wales: Census 2021 - Office for National Statistics (ons.gov.uk)
[16] Rural/urban local authority (LA) classification (England) - Office for National Statistics (ons.gov.uk)
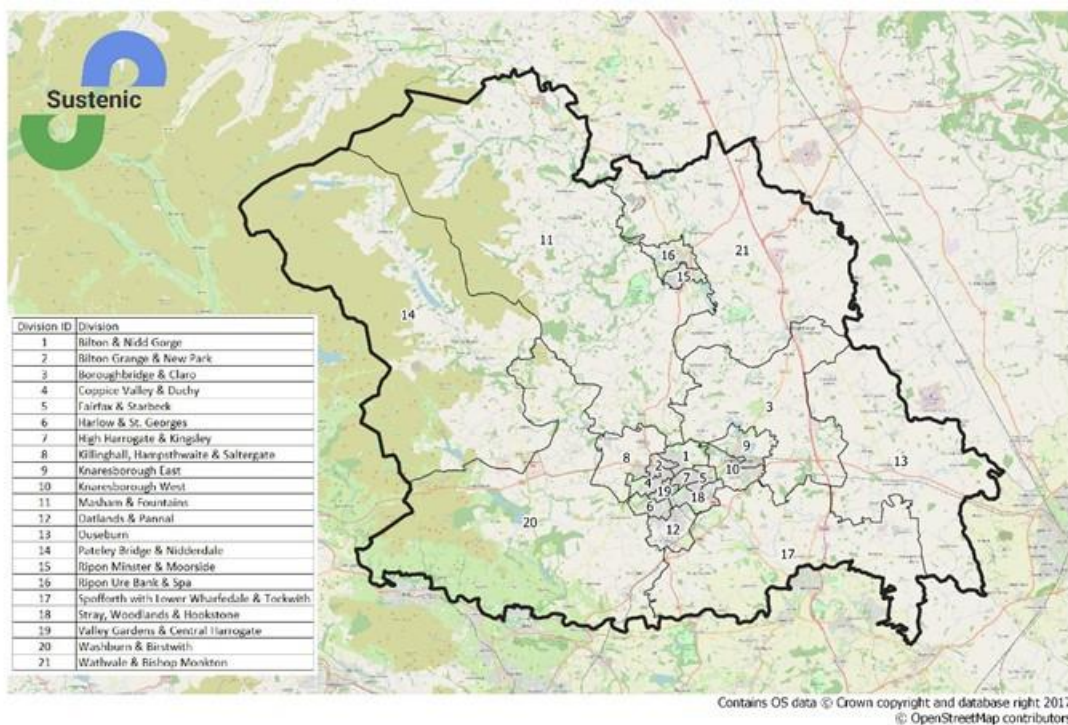[17] Live tables on dwelling stock (including vacants) - GOV.UK (www.gov.uk)
[18] The new council and devolution for North Yorkshire | North Yorkshire County Council

The newly formed council will allow services to be combined rather than duplicated and provide a stronger voice in the North. Services such as Environmental Health, and Housing and Housing benefits will be delivered as one through the North Yorkshire Council from April 2023.

Map 2 shows a map of the North Yorkshire Council Electoral Divisions from April 2023 within the Harrogate boundary.

Map 2: North Yorkshire Council Electoral Divisions from April 2023 within the Harrogate boundary

Division ID	Division
1	Bilton & Nidd Gorge
2	Bilton Grange & New Park
3	Boroughbridge & Claro
4	Coppice Valley & Duchy
5	Fairfax & Starbeck
6	Harlow & St. Georges
7	High Harrogate & Kingsley
8	Killinghall, Hampsthwaite & Saltergate
9	Knaresborough East
10	Knaresborough West
11	Masham & Fountains
12	Oatlands & Pannal
13	Ouseburn
14	Pateley Bridge & Nidderdale
15	Ripon Minster & Moorside
16	Ripon Ure Bank & Spa
17	Spofforth with Lower Wharfedale & Tockwith
18	Stray, Woodlands & Hookstone
19	Valley Gardens & Central Harrogate
20	Washburn & Birstwith
21	Wathvale & Bishop Monkton

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In April 2019, Harrogate Borough Council agreed a notice of motion, declaring the council's support for measures to address the climate emergency as outlined by the UN Intergovernmental Panel on Climate. Harrogate published the third version of their 'Carbon Reduction Strategy'[19] in April 2022, which describes the vision that by 2038 the Harrogate District will have a net zero-carbon economy. The council will lead the district, by using their place-shaping powers, and by continually improving their own operations.

For new housing the strategy includes:

- Use their powers within the planning system to address climate change and enforce high energy efficiency standards in new builds

For existing residential stock the strategy includes:

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[19] Carbon reduction strategy (harrogate.gov.uk)

- Make the most of available funding to retrofit private sector housing with energy efficiency measures
- Develop and implement a plan to make council housing net-zero carbon
- Continue enforcing the Domestic Minimum Energy Efficiency Standard (MEES) Regulations in private rented accommodation

The strategy also highlights that reducing carbon emissions often also results more immediate local benefits such as lower energy bills, cleaner air, better quality housing and economic benefits.

Climate Change Strategy for North Yorkshire

The draft Climate Change Strategy for North Yorkshire[20] has been released for consultation, which will be ongoing until the 7th of April 2023. The strategy has an ambition to be a carbon negative region by 2040.

The built environment, including domestic housing, is mentioned as a mitigation priority, as 19% of carbon emissions in North Yorkshire come from domestic housing. The strategy notes the challenges in North Yorkshire related to the age and traditional construction of the housing stock, and the protected landscapes and historic listed buildings, all of which require specific retrofit actions. The strategy also notes that North Yorkshire Council can help to deliver the Routemap to Carbon Negative ambition to 'retrofit buildings at scale to reduce energy demand'.

York & North Yorkshire's Routemap to Carbon Negative

York & North Yorkshire's Routemap to Carbon Negative is a co-owned plan to deliver net zero by 2034 and carbon negative by 2040[21]. It describes priorities and actions taking place between 2022 and 2027. One of the sectors addressed in the Routemap is Heat & Buildings, which has a scale of ambition to:

- Retrofit homes to at least an EPC C rating - 180,000 by 2030 and 250,000 by 2038
- Retrofit public buildings to at least an EPC C rating or above by 2027
- Large-scale deployment of heat pumps – 130,000-200,000 will be required by 2030, and 200,000-270,000 by 2038
- Deploy district heating to 10% of buildings by 2030 and over 18% of buildings by 2038
- Install Hydrogen boilers in between 13%-40% buildings by 2038 (dependant on gas grid deployment)
- Eliminate oil boiler use by 2030

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[20] [Climate change strategy 2023 to 2030 | North Yorkshire Council](#)
[21] [York & North Yorkshire's Routemap to Carbon Negative 040123.pdf (ynylep.com)](#)

- Deploy rooftop solar PV on 70,000 homes by 2030 and 101,000 by 2038
- Deploy biobased construction materials in 2,000 new homes by 2030, and 14,000 new homes by 2038

The overall vision for heat and buildings in the Routemap is 'buildings that are affordable to heat without using fossil fuels'.

These strategic documents illustrate the local and regional aims relevant to domestic retrofit.

Sustenic Dwelling Level Stock Profiles

The Sustenic Dwelling Level Stock Profiles have been developed to allow local authority officers to gain vital insights into the housing stock for their area, by using open data made available on energy efficiency, dwelling and household characteristics. Where this information is not complete for all dwellings within an area, Sustenic have developed a methodology which maximizes the use of the detailed dwelling level data, while also using the higher level information to ensure the outputs are representative and valid for all dwellings.

At Sustenic our team of experts have worked in housing, energy efficiency, building and energy surveys and modelling for over 20 years. This includes local area modelling for local authorities and national governments. This knowledge of the sensitivities required when applying known datasets to the wider housing stock, to ensure the resulting picture of the stock is valid, has been at the centre of the Sustenic Stock Profiles.

The use of open data also means that the local authority officers can access the data source themselves, if required. This provides greater transparency and potential for data sharing than where sources include commercial datasets whose licence conditions tend to be far more restrictive.

The main source of dwelling level information used to create the Sustenic Stock Profiles is the Energy Performance of Buildings Data: England and Wales, Domestic Energy Performance Certificate (EPC) dataset[22]. While there are widely shared concerns over the reliability of the EPC data, the experience of the Sustenic team is that this is the best source of dwelling level data available as open data. The analysis carried out for this project endeavours to identify and remove inconsistencies within the records which could be detrimental to the analysis of the housing stock. Appendix 1 provides a list of data sources used in the development of the Sustenic Stock Profiles.

For Harrogate the dataset used for this project includes records up to 30 September 2022. As well as a dwellings current energy performance, the EPC dataset includes information collected through the EPC survey of the dwelling, such as dwelling age, dwelling type, construction and levels of insulation. Detailed analysis of this data provides necessary

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[22] Energy Performance of Buildings Data England and Wales (opendatacommunities.org)

understanding of required improvements to dwellings to move the housing stock towards net zero carbon targets.

The EPC dataset for Harrogate had lodgments for 49,554 dwellings. Where a dwelling had more than one lodgment, the most recent record for that dwelling was used. This dataset, therefore provided survey data for 66% of the 74,934[23] dwellings in Harrogate.

Use of the bulk EPC dataset for analysis of the housing stock must take account of the bias within the data. As EPCs have only been collected since 2008, and are only required when a house is sold, rented or for various schemes, dwellings without an EPC are going to include a high proportion of dwellings which have been occupied by the same household since before 2008. This means that using summary statistics of the EPC dataset without taking account of the bias would produce analysis which is not representative of all dwellings within an area.

For the remaining 34% of dwellings across Harrogate, OS AddressBase was used to identify the residential dwellings in Harrogate.

Using the OS AddressBase dataset, 78,295 residential dwellings were identified. This is higher than the Table 100 figure of 74,934.

The EPC data was merged with the OS AddressBase dataset using the UPRN (Unique Property Reference Number). 46,510 of the EPC records were successfully matched to the OS AddressBase data. Therefore the EPC data covers 59% of the 78,295 dwelling identified in Harrogate.

Once the distribution of all dwellings is established, small area data on dwelling characteristics are used to understand the types of dwellings, based on dwelling age and tenure which do not have EPC data. The stereotypes of these dwellings are then used to replicate EPC data from dwellings within the same small area and stereotypes, without replacement, ensuring the known distributions within the EPC for similar dwellings is retained, while adjusting for the bias in the EPC dataset.

The Sustenic Dwelling Level Stock Profiles results provided within this report, as well as the dataset[24] provided to Harrogate will provide the Council with information on the current energy efficiency of the housing stock and the retrofit measures which will be required to improve the efficiency of the existing homes within Harrogate. This information will support and inform the climate change strategy and target of becoming net zero by 2034.

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[23] Live tables on dwelling stock (including vacants) - GOV.UK (www.gov.uk)
[24] The Sustenic Dwelling Level Stock Profiles dataset were provided to Harrogate at dwelling level to allow the council to carry out further analysis as required.

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Energy Efficiency

The average energy efficiency rating for dwellings in Harrogate is 62, 4 points poorer than the average for England (66)

The implications of Harrogate's lower energy efficiency rating are that its dwellings are using more energy than the average for England, resulting in higher energy costs and greater environmental impact

The Standard Assessment Procedure (SAP) is the methodology used by the government to assess and compare the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performance that are needed to underpin energy and environmental policy initiatives[25].

The SAP methodology is based on a standard occupancy, meaning that it does not take into account the energy use of the occupying household but seeks to assess the energy and environmental performance of a dwelling based on a set heating pattern. This allows an assessment of a dwelling to be more objective and fairer comparisons to be made with other dwellings as they are not influenced by the behaviour of the current householder.

The SAP rating is based on the energy costs associated with space heating, water heating, ventilation and lighting, less cost savings from on-site energy generation technologies. It is adjusted for floor area so that it is essentially independent of dwelling size for a given built form[26].

For existing buildings, a simplified version of SAP called Reduced Data SAP (RdSAP) is used to assess the energy performance. An RdSAP assessment will use a set of assumptions about the building based on conventions and requirements at the time the building was constructed.

SAP and RdSAP produces an energy efficiency rating for a dwelling between 1 and 100, with 1 being the lowest energy efficiency rating. The energy efficiency ratings are often displayed in EPC bandings of A-G ratings, with EPC Band A being the highest energy efficiency rating.

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[25] Standard Assessment Procedure - GOV.UK (www.gov.uk)
[26] SAP 10.2 - 21-04-2022.pdf (bregroup.com)

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The energy efficiency ratings for each band are as follows:

- EPC Band A   92 – 100 (most efficient)
- EPC Band B   81 – 91
- EPC Band C   69 – 80
- EPC Band D   55 – 68
- EPC Band E   39 – 54
- EPC Band F   21 – 38
- EPC Band G   1 – 20 (least efficient)

Current Energy Efficiency

The average energy efficiency rating for dwellings in Harrogate is 63. This is equivalent to an EPC Band D rating.

In England the average energy efficiency rating is 66 (EHS 2020)[27], also within Band D. While the average EPC Band in Harrogate is the same as for England, the overall energy efficiency in Harrogate is lower than for England by 3 points.

The LAD and HUG schemes are directed towards improving dwellings to a minimum of EPC Band C. With this being the main source of funding for local authorities to improve the energy of the fuel poor it sets an important measure against which to compare the housing stock in any local authority.

Table 1 shows the distribution of current energy efficiency ratings of dwellings by EPC Band in Harrogate. In Harrogate there are 49,104 (63%) dwellings which are below an EPC Band C. Of these 4,027 (5%) have an EPC Band F or G. Figure 1 shows the distribution of current energy efficiency rating of dwellings by EPC band in Harrogate.

Table 1: Number and Percentage of dwellings by EPC Band in Harrogate

EPC Band	Number of Dwellings	Per cent
Band A	275	0%
Band B	8,978	12%
Band C	19,938	25%
Band D	32,104	41%
Band E	12,973	17%
Band F	3,186	4%
Band G	841	1%
All Dwellings	**78,295**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

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[27] English Housing Survey: headline report (publishing.service.gov.uk)

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Figure 1: Percentage of dwellings in each EPC Band in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 2 shows the distribution of current energy efficiency ratings of dwellings by EPC band in Harrogate compared to England.

Compared to the distribution for England, Harrogate has a higher proportion of dwellings in the highest EPC Bands A and B, with 12% compared to the national figure of 3%. While this is positive, there is also a higher proportion of dwellings with low energy efficiencies in Harrogate. In Harrogate 17% of dwellings are in EPC Band E compared to 8% nationally, and 4% are in EPC Band F compared to 2% nationally. The same proportion of dwellings are in EPC Band G as found nationally, 1%.

Figure 2: Percentage of dwellings in each EPC Band in Harrogate compared to England

Source: Sustenic Dwelling Level Stock Profiles 2023

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Environmental Impact rating

As mentioned above, SAP ratings for energy efficiency are cost based and adjusted by floor area. The Environmental Impact (EI) rating is based on the annual carbon emissions associated with space heating, water heating, ventilation and lighting, less the emissions saved by energy generation technologies. It is adjusted for floor area so that it is essentially independent of dwelling size for a given building type. The Environmental Impact rating is expressed on a scale of 1 to 100, the higher the number the better the standard. The rating can exceed 100 if renewable generation technologies, such as photovoltaic panels are used[28]. The EI ratings can be banded using the same scoring ranges as used for the EPC Bands.

The average EI rating for dwellings in Harrogate is 61. This is equivalent to a Band D rating.

Figure 3 shows the distribution of the current environmental impact rating of dwellings by EPC Band in Harrogate.

The distribution of EI Bands for Harrogate is similar to the distribution of the energy efficiency rating. As the EI rating is based on annual carbon emissions this will be higher for less energy efficient dwellings with carbon heavy heating fuels, such as oil. Rural areas, which are off the gas network, are most likely to be dependent on these types of carbon heavy fuels.

Figure 3: Percentage of dwellings in each EI Band in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023

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[28] SAP 10.2 - 21-04-2022.pdf (bregroup.com)

Potential Energy Efficiency

Potential energy efficiency in this report is based on the EPC estimates of potential energy efficiency ratings that could be achieved if recommended improvement measures are undertaken. They are calculated by the approved EPC software used by the individual assessor and based on recommendations made by the assessor.

Assuming the EPC recommended improvement measures are applied to the dwelling stock in Harrogate, there is potential to improve the average energy efficiency score to 79. This would be equivalent to an EPC Band C rating. This would be an improvement on the current average energy efficiency of dwellings in Harrogate of 16 points.

This would also reduce the number of dwellings which were below an EPC Band C to 9,390 (12%) and of those, reduce the number of dwellings in EPC Band F or G to 524 (1%).

Table 2 shows the distribution of potential energy efficiency rating of dwellings by EPC Band in Harrogate.

Table 2: Number and Percentage of dwellings by Potential EPC Band in Harrogate

Potential EPC Band	Number of Dwellings	Per cent
Band A	8,094	10%
Band B	31,312	40%
Band C	29,499	38%
Band D	7,055	9%
Band E	1,811	2%
Band F	421	1%
Band G	103	0%
All Dwellings	**78,295**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 4 shows the potential percentage of dwellings in each EPC Band in Harrogate assuming basic improvement measures are applied.

Applying these basic improvement measures would also improve the EI rating in Harrogate to 77, equivalent to a Band C, an improvement of 16 points.

Figure 4: Potential percentage of dwellings in each EPC Band in Harrogate assuming basic improvement measures are applied

Source: Sustenic Dwelling Level Stock Profiles 2023

These estimates should be treated with some caution as the recommendations are not made as part of a more detailed survey such as the PAS2035 approach now mandated where government grant funding supports measures. Furthermore, barriers to retrofit such as conservation area requirements which usually prevent external insulation are not considered when making these recommendations. The alternative of internal insulation may well be impractical due to the size of the dwelling or less effective when implemented. While the EPCs do mention low carbon heating alternatives in their recommendations, their impact on potential costs and energy ratings are not calculated. This means that currently potential energy efficiency ratings and environmental impact ratings produced by EPCs can only ever be considered as a first step in identifying improvement measures for individual properties. They do, however, when aggregated provide a valuable insight into the potential that could be achieved and provide a very useful first step in developing an action plan to address the energy efficiency of the stock.

It should be emphasised that these issues are well recognised by the government who have their own EPC Action Plan, to address these and other concerns about EPCs, including a major upgrade to the Standard Assessment Procedure (SAP) on which EPCs are based due to be completed by 2025.

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Dwelling Characteristics

Harrogate has a higher proportion of older stock than found nationally, as well as a higher proportion of energy inefficient house types (detached and bungalows).

The higher levels of older stock and energy inefficient house types impact the retrofit measures which can be applied and the cost of retrofit are often higher for these types of dwellings compared to newer, smaller dwelling types.

Owner occupancy is higher and social stock lower in Harrogate compared to the national position

Improving energy efficiency in Harrogate will require targeted initiatives to incentivise homeowners to upgrade their properties

Dwelling Age

Understanding the dwelling age of housing across an area is important when considering energy efficiency. Improvements in materials and building methods and, in the modern era building regulations requiring increasingly higher standards of insulation, result in more modern dwellings having higher levels of insulation built into them. Furthermore, many dwellings which did not have insulation measures when built are likely to have some form of retrofit, for example, double glazing, wall and loft insulation. Older dwellings, pre 1930, are often harder and more costly to retrofit measures to and therefore in general have lower energy efficiency ratings compared to newer dwellings.

Table 3 shows the number and percentage of dwellings in each dwelling age band (detailed breakdown) in Harrogate. Figure 5 shows the percentage of dwellings grouped by dwelling age in Harrogate.

In Harrogate, 13,347 (17%) of dwellings were built before 1900, with a further 17,015 (22%) built between 1900 and 1949. Dwellings built before 1950 are more likely to be solid wall dwellings which are generally less energy efficient than cavity wall equivalents[29]. Harrogate has 26,541 (34%) dwellings which were built between 1950 and 1990.

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[29] Cavity wall construction became prevalent in some areas of the country, notably coastal areas, as early as the 1870s but outside of these areas was mainly introduced during the 1930s suburban building boom.

Harrogate has 21,392 (27%) dwellings which are more modern as these have been built since 1990. These dwellings are generally expected to have higher levels of energy efficiency as the more recent building regulations require higher standards of insulation compared to previous standards.

Table 3: Number and percentage of dwellings in Harrogate by dwelling age

Figure 5: Percentage of dwellings by grouped dwelling age in Harrogate

Dwelling Age	Number of Dwellings	Per cent
Pre 1900	13,347	17%
1900 - 1929	8,781	11%
1930 - 1949	8,234	11%
1950 - 1966	8,431	11%
1967 - 1975	6,953	9%
1976 - 1982	6,372	8%
1983 - 1990	4,785	6%
1991 - 1995	2,085	3%
1996 - 2002	5,483	7%
2003 - 2006	1,841	2%
2007 onwards	11,983	15%
All Dwellings	**78,295**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Source: Sustenic Dwelling Level Stock Profiles 2023

The Sustenic Stock Profiles dwelling age categories are based on the dwelling age categories provided in the EPCs. These dwelling age categories differ slightly from those provided in the EHS. The dwelling age categories that differ are pre 1950 from the Stock Profiles and pre 1945 from the EHS.

Table 4 shows the percentage of dwellings by dwelling age in Harrogate compared to England.

While there is a difference in the dwelling age categories between the Sustenic Stock Profiles and the EHS (pre 1950 compared to pre 1945 respectively), it is understood that house building was very low during this period. It is therefore reasonable to compare these two age categories. While between 1945 and 1950 there was a need to quickly provide housing for many after the destruction of the second world war, lack of money, labour and construction materials made progress slow. It was not until the 1950s, when the economy started to recover that house building picked up[30].

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[30] A brief history of British housing | Housing market | The Guardian

Table 4: Percentage of dwellings by grouped dwelling age in Harrogate compared to England

Dwelling Age	Harrogate	Dwelling Age	English Housing Survey 2020
Pre 1950	39%	Pre 1945	35%
1950 - 1990	34%	1945 - 1990	44%
Post 1990	27%	Post 1990	21%

Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 6 shows the percentage of dwellings grouped by dwelling age in Harrogate compared to England.

Compared to the distribution for England, Harrogate has a higher proportion of pre 1950 built dwellings with 39% in Harrogate compared to 35% in England. There were proportionally fewer dwellings built between 1950-1990 in Harrogate with 34% compared to 44%. Harrogate has a higher proportion of modern dwellings with 27% compared to 21% in England.

Figure 6: Percentage of dwellings by dwelling age in Harrogate compared to England

Source: Sustenic Dwelling Level Stock Profiles 2023

Dwelling Type

When considering energy improvements the dwelling type is likely to influence the cost and type of measure which can be installed. For example, wall insulation for detached dwellings will be required for all four faces compared to a mid-terrace which will only need two faces to be considered. Flats can also be more complex to retrofit as many are leasehold and therefore agreement from leaseholders and the freeholder is often required before external changes, such as upgrades to windows, can be made.

Table 5 shows the number and percentage of dwellings in each dwelling type band in Harrogate.

In Harrogate 24,594 (31%) dwellings are detached, 22,056 (28%) are semi-detached and 16,896 (22%) are terraces. There are 14,731 (19%) flats in Harrogate. 18 residential park homes[31] were identified in Harrogate.

Table 5: Number and percentage of dwellings in Harrogate by dwelling type

Dwelling Type	Number of Dwellings	Per cent
Detached	24,594	31%
Semi-Detached	22,056	28%
Mid Terrace	10,915	14%
End Terrace	5,981	8%
Flat	14,731	19%
Park Home	18	0%
All Dwellings	**78,295**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 6 and Figure 7 shows the percentage of dwellings by dwelling type in Harrogate compared to England. The EHS does not provide a breakdown of terraces between end terrace and mid terrace, but includes bungalows. The comparisons with the EHS are therefore based on these dwelling type categories.

Compared to the distribution for England, Harrogate has a higher proportion of detached dwellings with 26% in Harrogate compared to 18% in England, as well as a higher proportion of bungalows with 10% in Harrogate compared to 7% in England. The proportion of semi-detached dwellings is similar in Harrogate at 24% compared to 25% for England. There are proportionally fewer terraced dwellings in Harrogate at 21% compared to 27% for England.

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[31] Residential park homes are not required to have EPCs, however, as some were identified through the EPC data and additionally through validation processes, for this project they have been kept in for completeness. Further research into the number of residential and non residential park homes was outside the scope of this project . This figure is therefore likely to be an underrepresentation of the total number of park homes within Harrogate.

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The proportion of flats in Harrogate is lower compared to England, with 19% in Harrogate compared to 23% in England.

Table 6: Percentage of dwellings in Harrogate by dwelling type compare to England

Dwelling Type	Harrogate	English Housing Survey 2020
Detached	26%	18%
Bungalow	10%	7%
Semi-Detached	24%	25%
Terrace	21%	27%
Flat	19%	23%

Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 7: Percentage of dwellings by grouped dwelling type in Harrogate compared to England

Source: Sustenic Dwelling Level Stock Profiles 2023

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Tenure

Many of the current energy improvement schemes target specific tenures, for example, the Social Housing Decarbonisation Fund is for social housing. The tenure of the household within a dwelling will also affect who is responsible for decisions on energy efficiency improvements, for example, owner occupiers will make the decision on their own dwelling, whereas for private rented dwellings the landlord would be the decision maker. In general, social rented dwellings tend to have higher levels of energy efficiency. There are many reasons for this including their stock being generally more modern and therefore inherently more efficient, but it has also been very effectively targeted for retrofit schemes by both the social landlords themselves and the retrofit industry. In England, private dwellings in general have lower levels of energy efficiency, compared to the social rented stock. While superficially there is little difference in the performance of owner occupied and private rented stock in England, the private rented sector had the largest percentage in dwellings with Bands F and G[32].

In Harrogate 55,625 (71%) dwellings are owner occupied, 15,269 (20%) are privately rented and 7,401 (9%) are social housing.

Figure 8 shows the percentage of dwelling of each tenure in Harrogate.

Figure 8: Percentage of dwellings by tenure in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 7 and Figure 9 shows the percentage of dwellings by tenure in Harrogate compared to England.

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[32] English Housing Survey Energy Report, 2020-21, DLUHC 1% in the social rented stock have an EPC Band F or G compared to 4% in the private rented sector.

Compared to the tenure distribution in England, the proportion of privately rented dwellings in Harrogate at 20% is higher compared to England at 18%. Harrogate has a higher proportion of owner occupied dwellings, 71% compared to 65% in England. The proportion of social rented dwellings is lower in Harrogate, 9% compared to 17% in England.

Table 7: Percentage of dwellings in Harrogate by Tenure compared to England

Tenure	Harrogate	English Housing Survey 2020
Owner Occupied	71%	65%
Private Rented	20%	18%
Social	9%	17%

Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 9: Percentage of dwellings in Harrogate by Tenure compared to England

Source: Sustenic Dwelling Level Stock Profiles 2023

Ward and Division level summary

Table 8 and Table 9 provide summaries of the energy efficiency and dwelling characteristics of dwellings in Harrogate at ward (before April 2023) and division level respectively. The symbols within the table are provided as visual guides to highlight where the higher and lower values are within each distribution. Where coloured symbols have been used, red are where there is most need in terms of energy efficiency improvements and green the lower level of energy efficiency improvements, with yellow showing the mid range values.

The wards with the lowest average energy efficiency are Masham & Kirkby Malzeard (54, EPC Band E) and Washburn (55, EPC Band D).

All wards have potential of having an average EPC rating of Band C or above, assuming the EPC recommended improvement measures were applied. 11 of the 40 wards have the potential of having an average EPC rating of Band B.

The wards with the highest proportion of older dwellings (pre 1950) are Harrogate High Harrogate (69%), and Harrogate Bilton Grange (65%). The wards with the highest proportion of modern dwellings (post 1990) are Boroughbridge (54%) and Killinghall & Hamsthwaite (53%).

Harrogate Old Bilton and Harrogate Pannal have the highest proportion of owner occupied dwellings (both 88%). Harrogate High Harrogate has the highest proportion of privately rented dwellings (40%) and Harrogate Bilton Woodfield have the highest proportion of social dwellings (35%).

Harrogate Old Bilton and Marston Moor has the highest proportion of detached and semi-detached dwellings (both 86%). Harrogate Fairfax has the highest proportion of terraced dwellings (47%) and Harrogate Central has the highest proportion of flats (72%).

There is less variation in the results at division level.

The division with the lowest average energy efficiency is Masham & Fountains (55, EPC Band D). All divisions have potential of having an average EPC rating of Band C or above, assuming the EPC recommended improvement measures were applied. Five of the 21 divisions have the potential of having an average EPC rating of Band B.

The division with the highest proportion of older dwellings (pre 1950) is Valley Gardens and Central Harrogate (60%). Killinghall, Hamsthwaite & Saltergate has the highest proportion of modern dwellings (post 1990) (46%) .

Oatlands & Pannal has the highest proportion of owner occupied dwellings (84%). Valley Gardens and Central Harrogate has the highest proportion of privately rented dwellings (37%). Bilton & Nidd Gorge the highest proportion of social dwellings (21%).

Ouseburn has the highest proportion of detached and semi-detached dwellings (82%). Fairfax & Starbeck has the highest proportion of terraced dwellings (44%). Valley Gardens and Central Harrogate has the highest proportion of flats (69%).

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Table 8: Energy Efficiency and Dwelling Characteristics by Ward in Harrogate (before April 2023) (page 1 of 3)

Ward	Dwelling Count	Av. Energy Efficiency rating	Potential Av. Energy Efficiency rating	Av. Environ. Impact rating	Potential Av. Environ. Impact rating	Pre 1950	1950 - 1990	Post 1990	Owner Occupied	Private Rented	Social	Detached/ Semi-detached	Terrace	Flats
Bishop Monkton & Newby	2,087	66	84	64	81	26%	32%	43%	70%	19%	11%	82%	14%	4%
Boroughbridge	2,002	69	83	68	82	21%	25%	54%	70%	22%	9%	62%	24%	14%
Claro	1,801	59	80	57	76	40%	29%	31%	82%	14%	4%	79%	18	3%
Fountains & Ripley	1,989	56	78	54	75	46%	23%	31%	73%	22%	5%	81%	16%	3%
Harrogate Bilton Grange	1,914	61	80	58	78	65%	33%	2%	80%	16%	4%	68%	28%	4%
Harrogate Bilton Woodfield	2,102	65	78	62	77	30%	63%	7%	54%	10%	35%	43%	22%	35%
Harrogate Central	2,856	65	76	62	73	58%	15%	28%	48%	39%	12%	9%	19%	72%
Harrogate Coppice Valley	2,167	62	76	59	75	56%	30%	14%	59%	34%	7%	19%	32%	50%
Harrogate Duchy	1,505	65	76	62	73	35%	31%	34%	75%	21%	4%	44%	5%	52%
Harrogate Fairfax	2,098	64	80	61	78	58%	30%	12%	58%	16%	27%	36%	47%	17%
Harrogate Harlow	1,732	65	81	62	79	42%	40%	19%	80%	13%	7%	72%	16%	12%
Harrogate High Harrogate	2,160	65	78	62	76	69%	9%	21%	48%	40%	12%	10%	40%	50%
Harrogate Hookstone	1,562	65	80	62	78	21%	55%	24%	80%	11%	9%	76%	13%	11%
Harrogate Kingsley	2,116	67	81	65	80	43%	22%	35%	74%	15%	11%	56%	24%	20%
Harrogate New Park	1,978	67	82	64	81	20%	61%	19%	62%	17%	21%	47%	30%	22%
Harrogate Oatlands	1,805	61	77	57	74	55%	37%	8%	81%	17%	3%	69%	22%	9%
Harrogate Old Bilton	1,545	64	80	61	78	13%	69%	18%	88%	11%	1%	86%	12%	1%

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Table 8: Energy Efficiency and Dwelling Characteristics by Ward in Harrogate (before April 2023) (page 2 of 3)

Ward	Dwelling Count	Av. Energy Efficiency rating	Potential Av. Energy Efficiency rating	Av. Environ. Impact rating	Potential Av. Environ. Impact rating	Pre 1950	1950 - 1990	Post 1990	Owner Occupied	Private Rented	Social	Detached/ Semi-detached	Terrace	Flats
Harrogate Pannal	1,629	65	80	61	77	25%	45%	29%	88%	10%	3%	82%	14%	4%
Harrogate Saltergate	2,121	68	82	66	82	0%	61%	39%	73%	19%	8%	71%	18%	12%
Harrogate St Georges	2,029	66	79	62	77	39%	23%	38%	77%	18%	5%	56%	17%	27%
Harrogate Starbeck	1,703	64	80	61	79	45%	36%	19%	74%	17%	9%	49%	40%	11%
Harrogate Stray	2,054	61	75	56	71	62%	26%	12%	84%	14%	2%	71%	1%	28%
Harrogate Valley Gardens	2,455	63	75	59	72	63%	21%	17%	64%	35%	2%	16%	18%	66%
Killinghall & Hampsthwaite	2,001	71	85	70	84	18%	29%	53%	73%	23%	4%	77%	18%	5%
Knaresborough Aspin & Calcutt	1,789	64	79	60	76	27%	51%	22%	87%	10%	3%	84%	10%	6%
Knaresborough Castle	2,191	65	78	62	76	34%	33%	33%	67%	19%	14%	47%	23%	30%
Knaresborough Eastfield	1,726	67	82	65	81	12%	66%	22%	75%	13%	11%	72%	17%	12%
Knaresborough Scriven Park	1,963	67	81	64	79	37%	28%	36%	79%	11%	10%	68%	25%	7%
Marston Moor	1,940	62	81	60	78	29%	33%	38%	79%	15%	6%	86%	12%	2%
Masham & Kirkby Malzeard	1,735	54	78	51	74	54%	25%	22%	66%	24%	10%	72%	23%	5%
Nidd Valley	1,983	60	80	57	77	41%	31%	29%	77%	19%	5%	75%	23%	2%
Ouseburn	1,899	57	79	56	76	37%	23%	40%	78%	13%	9%	82%	17%	1%
Pateley Bridge & Nidderdale Moors	1,937	57	79	55	76	54%	22%	24%	69%	22%	9%	66%	25%	9%
Ripon Minster	2,040	66	80	64	78	40%	29%	31%	55%	20%	25%	33%	37%	30%

Table 8: Energy Efficiency and Dwelling Characteristics by Ward in Harrogate (before April 2023) (page 3 of 3)

Ward	Dwelling Count	Av. Energy Efficiency rating	Potential Av. Energy Efficiency rating	Av. Environ. Impact rating	Potential Av. Environ. Impact rating	Pre 1950	1950 - 1990	Post 1990	Owner Occupied	Private Rented	Social	Detached/ Semi-detached	Terrace	Flats
Ripon Moorside	1,883	66	81	64	80	15%	64%	21%	77%	12%	11%	71%	19%	9%
Ripon Spa	2,047	65	80	62	78	32%	31%	37%	66%	27%	7%	63%	20%	18%
Ripon Ure Bank	2,010	66	79	64	77	36%	26%	38%	65%	21%	14%	34%	38%	28%
Spofforth with Lower Wharfedale	1,736	59	79	57	76	45%	25%	30%	76%	16%	8%	76%	19%	5%
Washburn	1,949	55	77	53	74	48%	24%	28%	76%	19%	5%	82%	15%	3%
Wathvale	2,056	60	80	58	77	35%	32%	33%	69%	21%	11%	79%	20%	1%

Source: Sustenic Dwelling Level Stock Profiles 2023

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Table 9: Energy Efficiency and Dwelling Characteristics by North Yorkshire Council Division Harrogate (page 1 of 2)

Divisions (from April 2023)	Dwelling Count	Av. Energy Efficiency rating	Potential Av. Energy Efficiency rating	Av. Environ. Impact rating	Potential Av. Environ. Impact rating	Pre 1950	1950 - 1990	Post 1990	Owner Occupied	Private Rented	Social	Detached/ Semi-detached	Terrace	Flats
Bilton & Nidd Gorge	3,647	64	79	62	77	23%	66%	12%	68%	11%	21%	61%	17%	21%
Bilton Grange & New Park	3,892	64	81	61	79	42%	47%	11%	71%	17%	13%	57%	29%	13%
Boroughbridge & Claro	3,803	65	81	63	79	30%	27%	43%	75%	18%	7%	70%	21%	9%
Coppice Valley & Duchy	3,672	63	76	60	74	47%	30%	22%	65%	29%	6%	29%	21%	50%
Fairfax & Starbeck	3,801	64	80	61	78	52%	33%	15%	65%	16%	19%	42%	44%	15%
Harlow & St. Georges	3,761	65	80	62	77	40%	31%	29%	78%	16%	6%	64%	17%	20%
High Harrogate & Kingsley	4,276	66	80	63	78	56%	16%	28%	61%	28%	12%	33%	32%	35%
Killinghall, Hampsthwaite & Saltergate	4,122	70	84	68	83	9%	45%	46%	73%	21%	6%	74%	18%	8%
Knaresborough East	3,689	67	82	65	80	25%	46%	29%	77%	12%	11%	70%	21%	9%
Knaresborough West	3,980	64	79	61	76	31%	41%	28%	76%	15%	9%	63%	17%	20%
Masham & Fountains	3,750	55	78	53	75	49%	24%	27%	70%	23%	7%	77%	19%	4%
Oatlands & Pannal	3,434	63	78	59	75	41%	41%	18%	84%	13%	3%	75%	18%	7%
Ouseburn	2,565	57	79	55	76	39%	24%	37%	76%	15%	9%	82%	17%	1%
Pateley Bridge & Nidderdale	2,846	59	80	57	77	45%	28%	27%	72%	21%	7%	69%	25%	6%

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Table 10: Energy Efficiency and Dwelling Characteristics by North Yorkshire Council Division Harrogate (page 2 of 2)

Divisions (from April 2023)	Dwelling Count	Av. Energy Efficiency rating	Potential Av. Energy Efficiency rating	Av. Environ. Impact rating	Potential Av. Environ. Impact rating	Pre 1950	1950 - 1990	Post 1990	Owner Occupied	Private Rented	Social	Detached/ Semi-detached	Terrace	Flats
Ripon Minster & Moorside	3,923	66	80	64	79	28%	46%	26%	66%	16%	18%	51%	29%	20%
Ripon Ure Bank & Spa	4,057	66	79	63	77	34%	28%	38%	65%	24%	11%	48%	29%	23%
Spofforth with Lower Wharfedale & Tockwith	3,010	62	80	60	78	35%	29%	35%	79%	14%	7%	81%	15%	4%
Stray, Woodlands & Hookstone	3,616	63	77	58	74	44%	39%	17%	82%	13%	5%	73%	6%	21%
Valley Gardens & Central Harrogate	5,311	64	76	60	73	60%	17%	23%	55%	37%	7%	12%	19%	69%
Washburn & Birstwith	2,997	55	78	54	75	49%	23%	28%	76%	19%	5%	80%	18%	3%
Wathvale & Bishop Monkton	4,143	63	82	61	79	30%	32%	38%	69%	20%	11%	80%	17%	2%

Source: Sustenic Dwelling Level Stock Profiles 2023

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Energy Efficiency Improvements

Harrogate has 49,104 (63%) dwellings which are below Band C. Of these, 24,320 of their lofts still require improved insulation and 11,082 require improved glazing. Wall insulation is more complex with 8,636 cavity walls still requiring insulation as well as 11,638 stone walls that are uninsulated.

These are just a few of the indicators of the extensive work needed to bring dwellings in Harrogate up to energy efficiency standards necessary to achieve decarbonisation.

In Harrogate there are 49,104 (63%) dwellings which are below an EPC Band C (see earlier section Current Energy Efficiency).

Assuming basic improvement measures are applied to these dwellings, there is potential to reduce the number of dwellings below an EPC Band C to 9,390 (12%) (see earlier section Potential Energy Efficiency).

Table 11, Table 12 and Table 13 show the dwelling characteristics of the dwellings below an EPC Band C. Tenure (Table 11) provides an indication of who will be responsible for retrofitting measures; the owner occupier, private landlord or social landlord. Dwelling age (Table 12) shows that the majority below an EPC Band C are pre 1991 dwellings. Dwelling type (Table 13) shows that there is no particular dwelling type which is more likely to be below an EPC Band C, with the exception of park homes where all 18 identified are below an EPC Band C.

Table 11: Dwelling with an EPC Band below Band C by Tenure in Harrogate

Tenure	Number of Dwellings below EPC Band C
Owner Occupied	36,348
Private Rented	9,855
Social	2,901
All Dwellings	**49,104**

Source: Sustenic Dwelling Level Stock Profiles 2023

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Table 12: Dwelling with an EPC Band below Band C by Dwelling Age in Harrogate

Dwelling Age	Number of Dwellings below EPC Band C
Pre 1950	26,135
1950 - 1990	17,880
Post 1990	5,089
All Dwellings	**49,104**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 13: Dwelling with an EPC Band below Band C by Dwelling Type in Harrogate

Dwelling Type	Number of Dwellings below EPC Band C
Detached	16,252
Semi-Detached	14,910
Mid Terrace	7,376
End Terrace	3,797
Flat	6,751
Park Home	18
All Dwellings	**49,104**

Source: Sustenic Dwelling Level Stock Profiles 2023

To understand the distribution of dwellings with an EPC Band below Band C, Map 3 shows the percentage of dwellings within each Census Output Area (COA) in Harrogate which have an EPC Band below Band C. Map 4 and Map 5 show the percentage of dwellings within each COA which have an EPC Band below Band C within the areas around Harrogate town and Knaresborough; and Ripon respectively. These larger scale maps make the more densely populated areas visible.

COAs are the lowest level of geography produced within the census. COAs nest within Council areas and also act as the basic "building-blocks" for the creation of other geographies[33], such as Lower Super Output Areas (LSOAs). They contain approximately equal numbers of usual residents, and are intended to provide geographies that allow reporting of statistics across time on a consistent geographical base[34]. The COAs used within these maps are based on the 2011 COAs. There are a total of 532 COAs in Harrogate.

There are 141 COAs in Harrogate with 78% or more of the dwellings with an EPC Band below Band C. Many of these COAs are in rural areas of Harrogate, notably Masham & Kirkby Malzeard, Pateley Bridge & Nidderdale Moors and Washburn wards. There are, however, also COAs within urban areas of Harrogate and Knaresborough within this range (78% or higher).

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[33] Census 2011 - Output Areas - data.gov.uk
[34] 2011 Census - Office for National Statistics (ons.gov.uk)

Map 3: Percentage of dwellings with an EPC Band below Band C at COA level in Harrogate

Map 4: Percentage of dwellings with an EPC Band below Band C at COA level in Harrogate (Harrogate town and Knaresborough area)

Map 5: Percentage of dwellings with an EPC Band below Band C at COA level in Harrogate (Ripon area)

The energy efficiency improvements which can be made to dwellings with an EPC Band below Band C to improve the EPC rating vary across Harrogate. As well as the tenure, dwelling age and dwelling type, which retrofit measures are required will need to be taken into account.

Loft insulation, double or triple glazing and cavity wall insulation are all considered simple retrofit measures which can be applied to a dwelling to improve the energy efficiency of a dwelling where these are not already present. These measures are often relatively low cost and are non-intrusive to a householder.

Measures such as external wall insulation are more expensive measures to retrofit and may not be appropriate for dwellings with complex configurations. Internal wall insulation is an alternative to external wall insulation, however this does remove internal floor space and can be intrusive to the householder as it often involves redecorating and refitting radiators or other heating elements.

It has already been explained that decisions to upgrade inefficient heating systems where recommended by EPCs are less straightforward than other EPC recommendations. These recommendations may now conflict with the governments decarbonisation plans which favour low carbon heat sources over fossil fuelled systems that will have been recommended especially in older EPCs. The analysis below, however, is useful in identifying where heating systems are inefficient.

Improving the heating in these dwellings will, however, require careful consideration of the system to upgrade or install as the government is committed to phasing out gas boilers by 2035. The Government has already indicated that new homes will effectively require a low carbon heat source, such as a heat pump, as part of the Future Homes Standard which is planned for 2025. With the grid planned to be decarbonised by 2035 this will be a major part of delivering the Net Zero strategy for buildings. For rural areas such as Harrogate there are going to be a high proportion of dwellings which are not near to a mains gas network and in many cases, especially with larger rural houses, oil heating systems will have been used as the most efficient and cost effective heating fuel alternative to gas but are still often identified as inefficient systems by EPCs. These are areas where the Boiler Upgrade Grant may be of particular interest as householders seek to improve their heating systems by installing heat pumps.

Loft insulation

The levels of loft insulation vary between no insulation, low levels of insulation (25mm-100mm) and high levels of insulation up to 400mm. There are also dwellings where no loft is present, for example mid floor flats.

Table 14 shows the number and percentage of dwellings with an EPC Band below Band C by loft insulation level. These have been split by dwellings where loft insulation is not required and dwellings where there is either; existing loft insulation of 200mm or more or where there is no loft. There are 24,320 (50%) dwellings with an EPC Band below Band C which could be improved by retrofitting loft insulation.

Table 14: Dwellings with an EPC Band below Band C by Levels of Loft Insulation in Harrogate

Loft Insulation	Number of Dwellings below EPC Band C	Per cent
Loft with 200mm+ of Insulation or No Loft	24,784	50%
Loft Insulation required	24,320	50%
All Dwellings	**49,104**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

When planning retrofit measures, economies of scale can often be made by retrofitting multiple dwellings within close proximity. Economies of scale apply to costs of finding the appropriate dwellings, survey costs and the labour costs of installing the retrofit measures. For these reasons it is helpful to understand their geographical distribution.
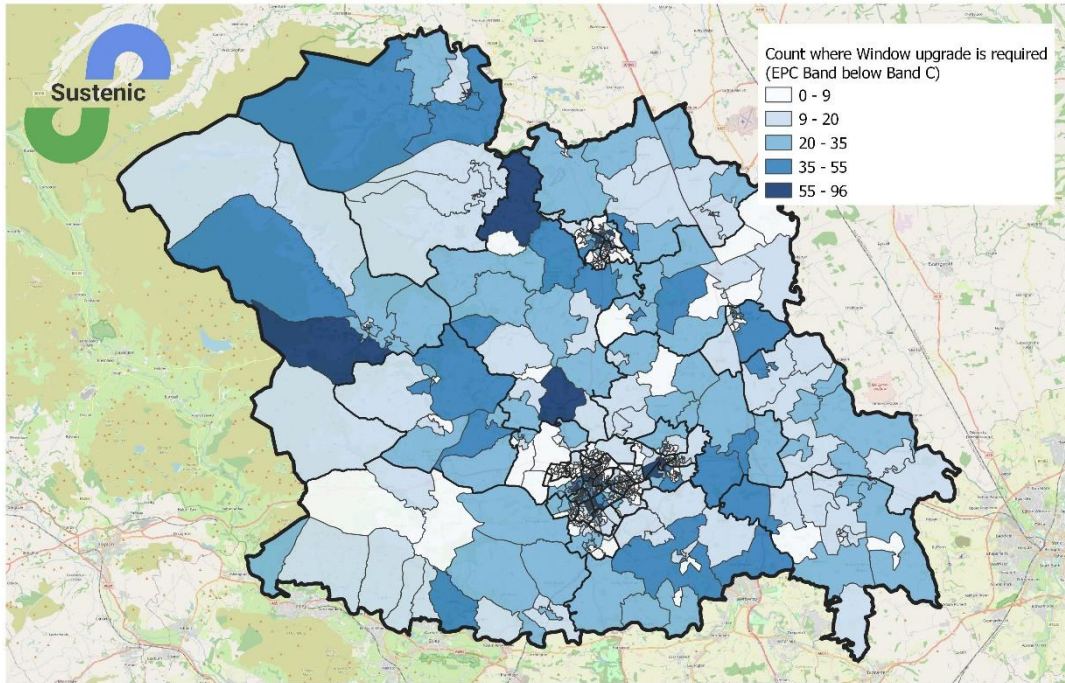
Map 6 to Map 8 below show the counts of where loft insulation is required for dwellings with an EPC Band below Band C. These maps show that loft insulation measures are required across Harrogate. The areas with higher counts requiring loft insulation and which could therefore benefit from economies of scale are in areas of Harrogate town and Knaresborough.

Map 6: Count of dwellings with an EPC Band below Band C and where Loft Insulation is required at COA level in Harrogate

Map 7: Count of dwellings with an EPC Band below Band C and where Loft Insulation is required at COA level in Harrogate (Harrogate town and Knaresborough area)

Map 8: Count of dwellings with an EPC Band below Band C and where Loft Insulation is required at COA level in Harrogate (Ripon area)

Window Glazing

Double glazing or triple glazing are the glazing types which provide reasonable levels of energy efficiency to a dwelling. While in most cases where glazing is retrofitted, all windows to a dwelling will be replaced or otherwise upgraded at the same time, there are also cases where this does not happen. This means that in some cases there will be a mix of glazing within a dwelling.

Table 15 shows the number and percentage of dwellings with an EPC Band below Band C by glazing type. These have been split into two groups of dwellings: first where glazing improvement is not required, defined as dwellings with full double or triple glazing. Second, dwellings where window glazing improvement is required defined as dwellings with partial double, partial triple, single or secondary glazing.

There are 11,082 (23%) dwellings with an EPC Band below Band C which could be improved by improving the glazing.

Table 15: Dwellings with an EPC Band below Band C by Window Type in Harrogate

Windows	Number of Dwellings below EPC Band C	Per cent
Full Double Glazing or Triple Glazing	38,017	77%
Window improvement required	11,082	23%
All Dwellings	**49,099**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Map 9 to Map 11 show the counts of where improvements to glazing is required for dwellings with an EPC Band below Band C. These maps show that improvements to glazing are required across Harrogate. The areas with higher counts requiring improvements to glazing (and which could therefore benefit from economies of scale in a program of improvements) are in the areas of Harrogate and Ripon.

Map 9: Count of dwellings with an EPC Band below Band C and partial double/triple glazing or single/secondary glazing at COA level in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023
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Map 10: Count of dwellings with an EPC Band below Band C and partial double/triple glazing or single/secondary glazing at COA level in Harrogate (Harrogate town and Knaresborough area)

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Map 11: Count of dwellings with an EPC Band below Band C and partial double/triple glazing or single/secondary glazing at COA level in Harrogate (Ripon area)

Wall Insulation

The type of wall insulation required for a dwelling will depend on the wall type. Pre 1930 most dwellings will have been constructed with solid or stone walls. Post 1930 cavity walls became standard and as insulation standards improved, cavity wall insulation became a requirement for new dwellings. There have also been various cavity wall insulation schemes to retrofit these types of dwellings.

Table 16 shows the number and percentage of dwellings with an EPC Band below Band C by wall type. 27,591 (56%) dwellings with an EPC Band below Band C have cavity walls. 6,429 (13%) dwellings have solid walls. 13,048 (27%) dwellings have stone walls. The other 2,036 dwellings are system built, timber frame or park homes, as well as nine cob constructed dwellings.

Table 16: Dwellings with an EPC Band below Band C by Wall Type in Harrogate

Wall Types	Number of Dwellings below EPC Band C	Per cent
Cavity Walls	27,591	56%
Solid Walls	6,429	13%
Stone Walls	13,048	27%
Timber	1,369	3%
System Built	646	1%
Park Homes	12	0%
Cob	9	0%
All Dwellings	**49,104**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

Cavity Walls

Table 17 shows the number and percentage of cavity wall dwellings with an EPC Band below Band C by insulation level. Of the 27,591 cavity wall dwellings with an EPC Band below Band C, 17,014 (62%) already have cavity wall insulation. 1,941 (7%) have partial wall insulation, this may be due to newer extensions being added with cavity wall insulation while the existing dwelling to which it is attached has uninsulated cavity walls. The remaining 8,636 (31%) dwellings have uninsulated cavity walls.

Table 17: Dwellings with an EPC Band below Band C and Cavity Walls by insulation level in Harrogate

Cavity Walls	Number of Dwellings below EPC Band C	Per cent
Insulated	17,014	62%
Partially insulated	1,941	7%
Uninsulated	8,636	31%
All Dwellings	**27,591**	**-**

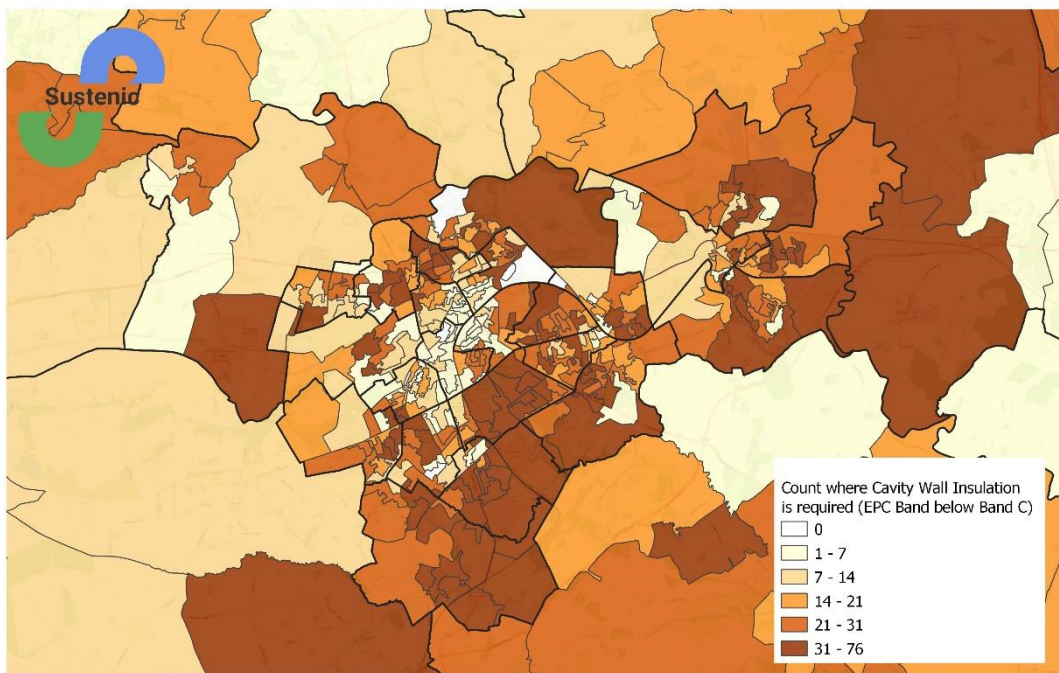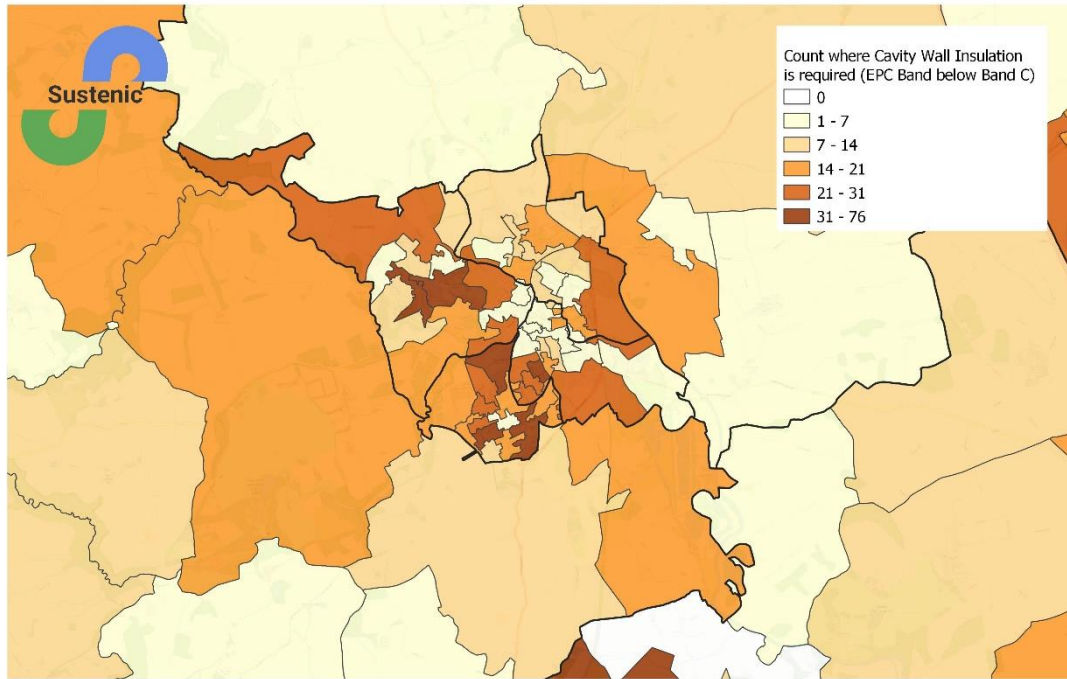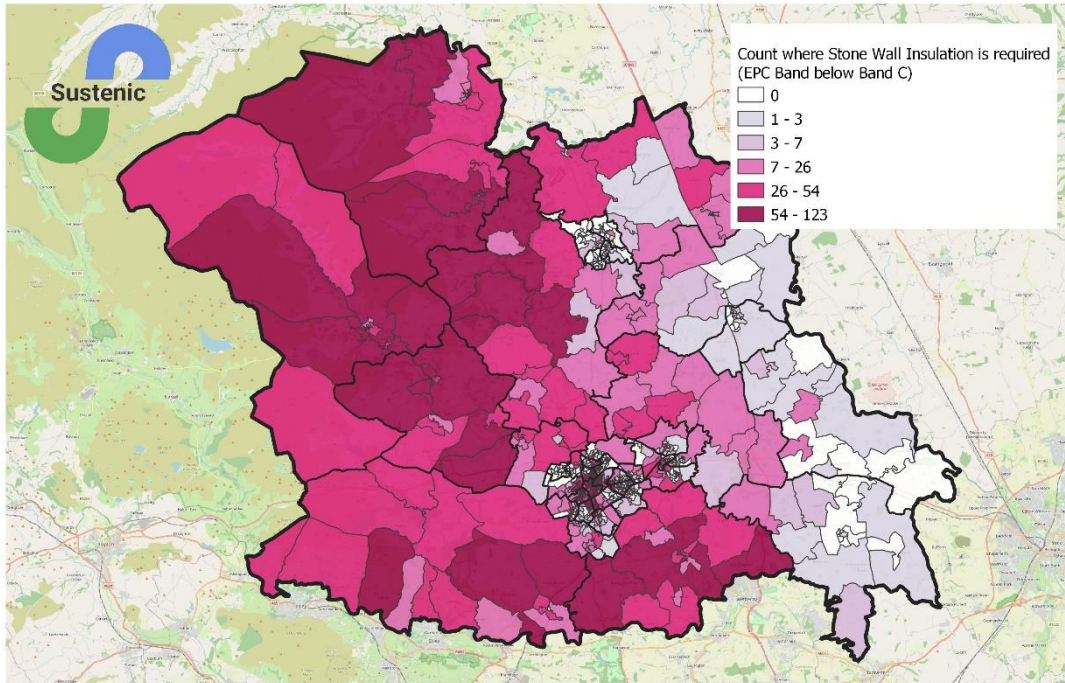Source: Sustenic Dwelling Level Stock Profiles 2023
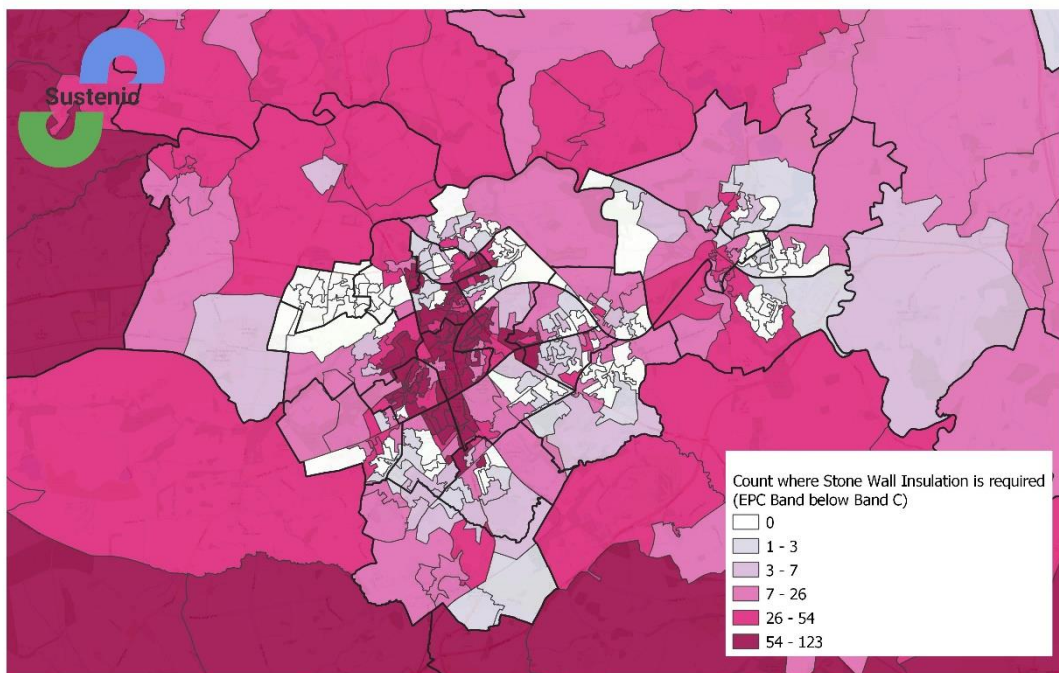
Map 12 to Map 14 show the counts of where cavity wall insulation is required for dwellings with an EPC Band below Band C. The areas with higher counts requiring cavity wall insulation are in Harrogate and Knaresborough.

Map 12: Count of dwellings with an EPC Band below Band C and uninsulated cavity walls at COA level in Harrogate

Map 13: Count of dwellings with an EPC Band below Band C and uninsulated cavity walls at COA level in Harrogate (Harrogate town and Knaresborough area)

Map 14: Count of dwellings with an EPC Band below Band C and uninsulated cavity walls at COA level in Harrogate (Ripon area)
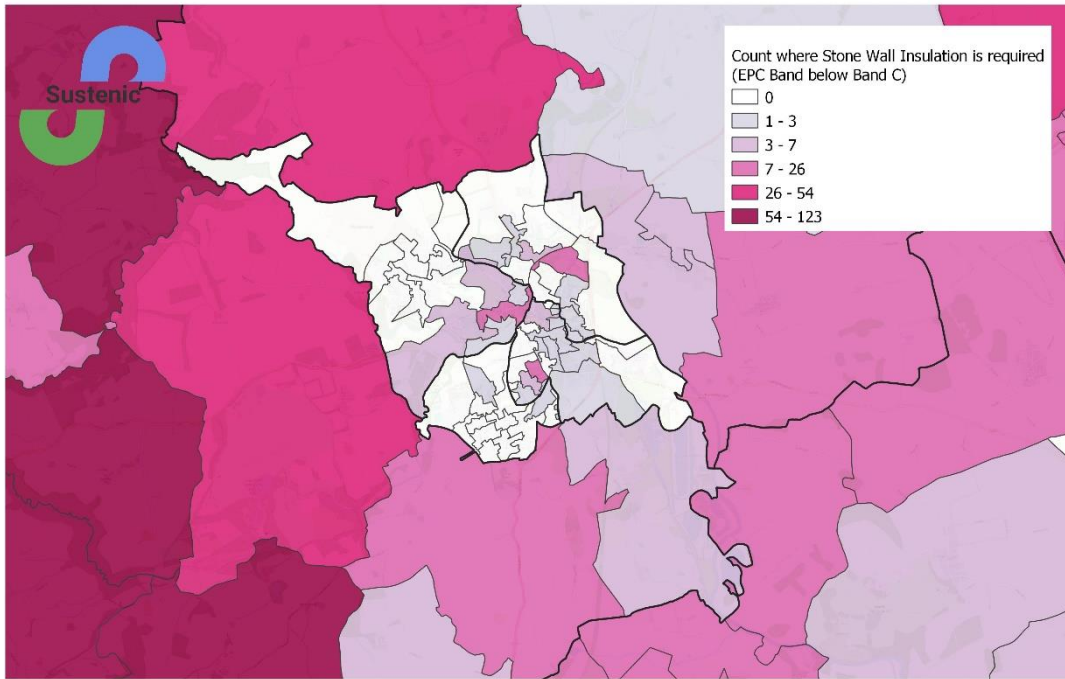

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Stone Walls

Table 18 shows the number and percentage of stone wall dwellings with an EPC Band below Band C by insulation level. Of the 13,048 stone wall dwellings with EPC Band below Band C, only 1,277 (10%) already have wall insulation. 133 (1%) have partial wall insulation. 11,638 (89%) of the stone wall dwellings are uninsulated.

Table 18: Dwellings with an EPC Band below Band C and Stone Walls by insulation level in Harrogate

Stone Walls	Number of Dwellings below EPC Band C	Per cent
Insulated	1,277	10%
Partially insulated	133	1%
Uninsulated	11,638	89%
All Dwellings	**13,048**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Map 15 to Map 17 show the counts of dwellings where wall insulation is required for stone wall dwellings with an EPC Band below Band C. These maps show that there are areas where no insulation retrofits are required for stone walls. These can been seen in areas of Marston Moor and Ouseburn . The areas with higher counts requiring wall insulation for stone wall dwellings are in Harrogate and rural areas of Fountains & Ripley, Masham & Kirkby Malzeard, Nidd Valley and Pateley Bridge & Nidderdale Moors.

Map 15: Count of dwellings with an EPC Band below Band C and uninsulated stone walls at COA level in Harrogate

Map 16: Count of dwellings with an EPC Band below Band C and uninsulated stone walls at COA level in Harrogate (Harrogate town and Knaresborough area)

Map 17: Count of dwellings with an EPC Band below Band C and uninsulated stone walls at COA level in Harrogate (Ripon area)

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Other Wall Types

Table 19 shows the number and percentage of dwellings with an EPC Band below Band C with wall types of solid wall, timber frame, system built, park home and cob . Of the 8,465 dwellings with other wall types with EPC Band below Band C, 1,464 (17%) already have wall insulation. 187 (2%) have partial wall insulation. 6,814 (81%) of these dwellings are uninsulated.

Table 19: Dwellings with an EPC Band below Band C and Other Wall Type (not Cavity or Stone) by insulation level in Harrogate

Other Wall Types	Number of Dwellings below EPC Band C	Per cent
Insulated	1,464	17%
Partially insulated	187	2%
Uninsulated	6,814	81%
All Dwellings	**8,465**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Heating Systems

Improving the efficiency of a heating system and therefore lowering the amount and in turn the cost of heating fuel required to heat a dwelling to a sufficient temperature will increase the energy efficiency of a dwelling.

Table 20 shows the number and percentage of dwellings with an EPC Band below Band C by the efficiency of the main heating system. 35,676 (72%) dwellings with an EPC Band below Band C have main heating systems which are classed as 'Very Good' or 'Good', 8,641 (18%) which are classed as having 'Average' and the other 4,727 (10%) dwellings are classed as having 'Poor' or 'Very Poor' main heating system efficiency.
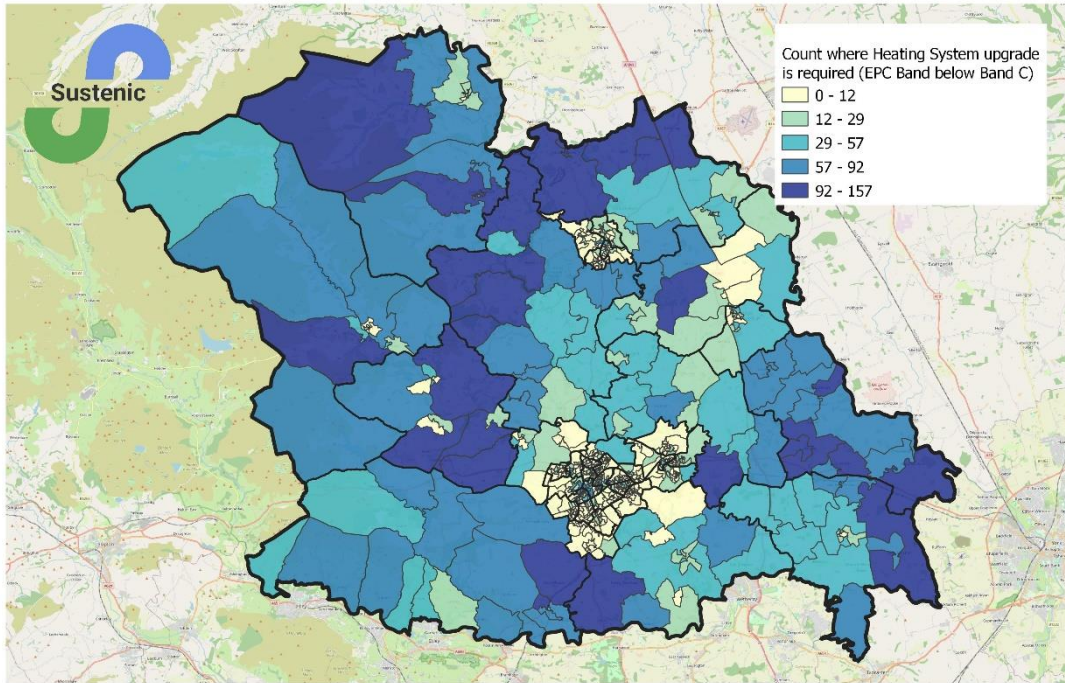
Table 20: Main heating system efficiency of dwellings with an EPC Band below Band C in Harrogate

Main Heating System Efficiency	Number of Dwellings below EPC Band C	Per cent
Very Good	1,264	2%
Good	34,412	70%
Average	8,641	18%
Poor	2,500	5%
Very Poor	2,287	5%
All Dwellings	**49,104**	-

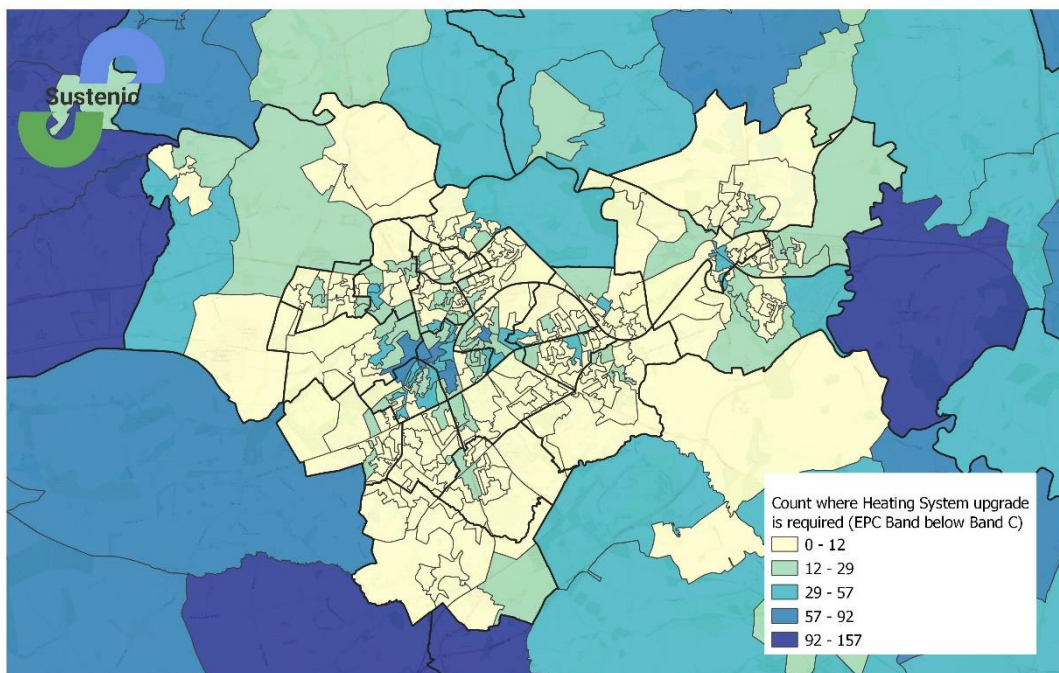Source: Sustenic Dwelling Level Stock Profiles 2023

Map 18 to Map 20 show the counts of dwelling where the main heating system efficiency are classed as 'Average', 'Poor' or 'Very Poor' with an EPC Band below Band C. These maps show that there are areas where the energy efficiency could be improved by upgrading the main heating system. The areas with higher counts requiring main heating improvements are widely spread across Harrogate, notably in the outskirts of Fountains & Ripley, Nidd Valley and Wathvale.

Map 18: Count of dwellings with an EPC Band below Band C and average, poor or very poor main heating system efficiency at COA level in Harrogate
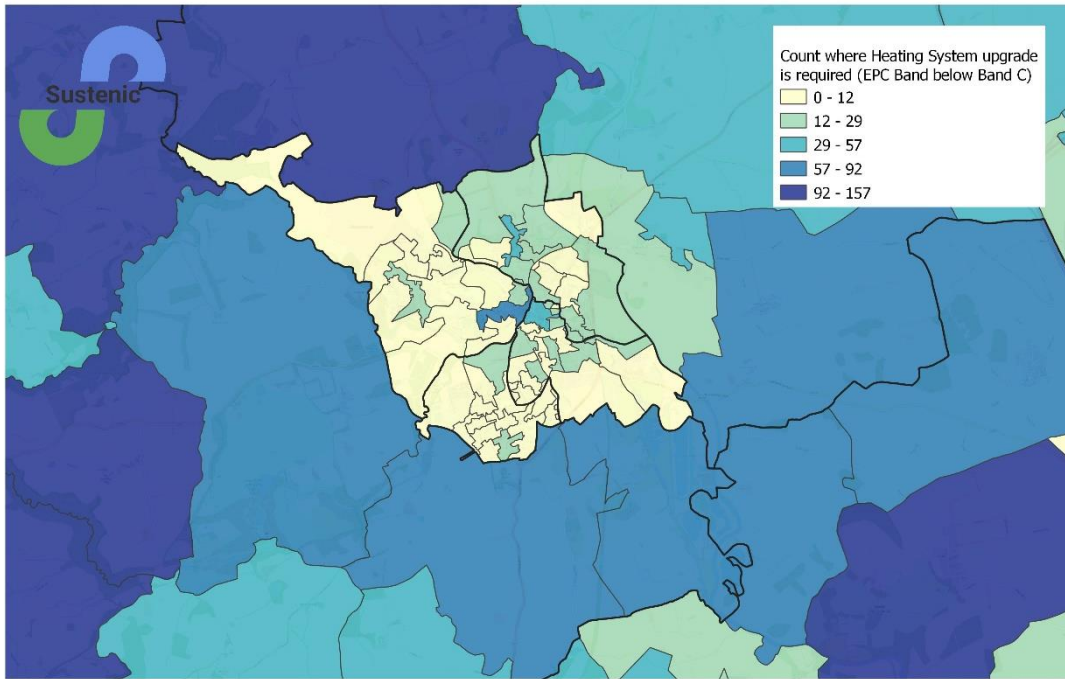

Map 19: Count of dwellings with an EPC Band below Band C and average, poor or very poor main heating system efficiency at COA level in Harrogate (Harrogate town and Knaresborough area)

Map 20: Count of dwellings with an EPC Band below Band C and average, poor or very poor main heating system efficiency at COA level in Harrogate (Ripon area)

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
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Off the Gas Network

Mains gas is currently the most cost effective heating fuel. For dwellings off the gas network, the main fuel used will therefore be more expensive which can contribute to a lower energy efficiency rating.

Table 21 shows the number and percentage of dwellings with an EPC Band below Band C and which are off the gas network by the efficiency of the main heating system. There are 6,056 dwellings with an EPC Band below Band C and which are off the gas network. Of these, 5,232 (86%) have an 'Average', 'Poor' or 'Very Poor' heating system.

Table 21: Main heating system efficiency of dwellings off the gas network with an EPC Band below Band C in Harrogate

Main Heating System Efficiency	Number of Off Gas Dwellings below EPC Band C	Per cent
Very Good	28	1%
Good	796	13%
Average	3,472	57%
Poor	1,213	20%
Very Poor	547	9%
All Dwellings	**6,056**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

With the Government committed to phasing out gas boilers by 2035, extending the gas network is clearly not expected to be a solution to improving the energy efficiency of the main heating system for these dwellings. This is discussed further in the Hard to Decarbonise section of this report.

Ward and Division level summary

Table 22 and Table 23 provide summaries of the energy efficiency retrofit measures required for dwellings below EPC Band C in Harrogate at ward (before April 2023) and division level respectively.

The ward with the highest percentage of dwellings with an EPC below Band C is Harrogate Bilton Grange (81%). In terms of count, Harrogate Central has the higher number of dwellings with an EPC below Band C (1,642).

Harrogate Bilton Grange has the highest count of dwellings where loft insulation is required (9,46). Harrogate Fairfax, Harrogate Oatlands and Harrogate Stray also have high counts of dwellings with an EPC below Band C which require loft insulation installed or improved.

Harrogate Valley Gardens has the highest count of window glazing upgrade required (754). The counts are also high in Harrogate Central.

Harrogate Central has the highest count of stone wall dwellings with an EPC below Band C which require wall insulation (959). The counts are high (above 500) for 10 of the 40 wards. For dwellings where cavity wall insulation is required, Harrogate Fairfax and Harrogate Kingsley has the highest counts (both 359).

For improvements to main heating systems, Washburn has the highest count of dwellings with an EPC below Band C requiring heating improvements (1,184). Ouseburn has the highest count of off-gas dwellings requiring heating improvements (752)

The division (from April 2023) with the highest proportion of dwellings with an EPC below Band C is Washburn & Birstwith (77%). The division with the highest number of dwellings with an EPC below Band C is Valley Gardens & Central Harrogate (3,210).

Bilton Grange & New Park has the highest count of dwellings where loft insulation is required (1,542). Fairfax & Starbeck, Knaresborough West and Stray, Woodlands & Hookstone also have high counts of dwellings with an EPC below Band C which require loft insulation installed or improved (1,496, 1,380 and 1,354 respectively).

Valley Gardens & Central Harrogate has the highest count of window glazing upgrade required (1,356). The counts are also high in Coppice Valley & Duchy and Masham Fountains (843 and 854 respectively).

Valley Gardens & Central Harrogate has the highest counts of stone wall dwellings with an EPC below Band C which require wall insulation (1,878), followed by Masham Fountains (1,319). For dwellings where cavity wall insulation is required, Oatlands & Pannal has the highest count (978).

For improvements to main heating systems, Masham & Fountains and Ouseburn have the highest count of dwelling with an EPC below Band C requiring heating improvements (1,934 and 1,612 respectively). The highest count of off-gas dwellings requiring heating improvements are also in Masham Fountains and Ouseburn (1,080 and 1,029 respectively).

Table 22: Energy Efficiency retrofit measures required for dwelling below EPC Band C by Ward in Harrogate (before April 2023) (page 1 of 3)

Ward	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Bishop Monkton & Newby	51%	1,063	395	228	202	95	265	389	199
Boroughbridge	46%	929	454	191	130	11	265	210	18
Claro	70%	1,257	508	310	223	285	220	644	342
Fountains & Ripley	73%	1,449	639	458	173	578	164	1,013	533
Harrogate Bilton Grange	81%	1,546	946	177	390	394	126	94	0
Harrogate Bilton Woodfield	61%	1,275	657	119	254	240	283	134	4
Harrogate Central	57%	1,642	641	602	156	959	209	469	67
Harrogate Coppice Valley	69%	1,489	781	503	203	760	245	223	17
Harrogate Duchy	60%	905	330	340	202	278	103	191	37
Harrogate Fairfax	63%	1,329	804	221	359	176	308	139	2
Harrogate Harlow	63%	1,092	654	205	348	191	45	76	0
Harrogate High Harrogate	64%	1,376	651	396	110	821	238	220	17
Harrogate Hookstone	61%	952	536	110	321	47	45	97	0
Harrogate Kingsley	52%	1,109	637	217	359	143	116	145	27
Harrogate New Park	53%	1,058	596	76	305	267	78	213	52
Harrogate Oatlands	76%	1,368	802	268	474	190	263	118	1
Harrogate Old Bilton	70%	1,083	606	98	292	71	22	103	0

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Table 21: Energy Efficiency retrofit measures required for dwelling below EPC Band C by Ward in Harrogate (before April 2023) (page 2 of 3)

Ward	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Harrogate Pannal	62%	1,012	502	183	504	141	29	77	9
Harrogate Saltergate	49%	1,042	566	59	269	0	16	154	0
Harrogate St Georges	56%	1,138	522	453	231	385	121	63	2
Harrogate Starbeck	69%	1,171	692	118	295	109	359	116	0
Harrogate Stray	73%	1,507	818	504	533	303	163	113	0
Harrogate Valley Gardens	64%	1,568	561	754	200	919	238	386	112
Killinghall & Hampsthwaite	41%	828	432	124	223	216	8	110	30
Knaresborough Aspin & Calcutt	68%	1,223	681	201	317	127	110	144	4
Knaresborough Castle	61%	1,331	699	396	302	247	239	192	4
Knaresborough Eastfield	59%	1,023	550	103	369	14	57	167	5
Knaresborough Scriven Park	52%	1,023	608	212	334	112	103	125	2
Marston Moor	63%	1,229	544	217	171	25	353	704	377
Masham & Kirkby Malzeard	79%	1,364	616	392	145	730	45	906	537
Nidd Valley	69%	1,370	661	280	286	620	39	641	308
Ouseburn	73%	1,377	510	281	162	35	385	1,178	752
Pateley Bridge & Nidderdale Moors	74%	1,434	702	408	149	821	28	664	312
Ripon Minster	52%	1,058	606	245	211	41	382	159	9
Ripon Moorside	58%	1,090	585	83	308	2	66	107	0

Table 21: Energy Efficiency retrofit measures required for dwelling below EPC Band C by Ward in Harrogate (before April 2023) (page 3 of 3)

Ward	Percentage of Dwellings Below EPC Band C		Dwelling Count Below EPC Band C		Loft Insulation required		Window Glazing upgrade required		Cavity Wall Insulation required		Stone Wall insulation required		Other Wall Type insulation requried		Heating System upgrade required		Off Gas Heating System upgrade required	
Ripon Spa	▲	59%	▲	1,210	▲	562	●	306	●	197	●	26	▲	356	▦	173	▦	0
Ripon Ure Bank	●	54%	●	1,082	▲	578	▲	357	●	152	●	21	▲	512	▦	194	▦	26
Spofforth with Lower Wharfedale	◆	69%	▲	1,192	▲	530	●	285	●	226	▲	524	●	43	▦	531	▦	247
Washburn	◆	78%	◆	1,528	▲	612	●	313	●	311	◆	656	●	43	▦	1,184	▦	689
Wathvale	▲	67%	◆	1,382	▲	540	●	289	●	181	●	191	●	311	▦	862	▦	491

Source: Sustenic Dwelling Level Stock Profiles 2023

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Table 23: Energy Efficiency retrofit measures required for dwelling below EPC Band C by North Yorkshire Council Division in Harrogate (page 1 of 2)

Division (from April 2023)	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Bilton & Nidd Gorge	65%	2,358	1,263	217	546	311	305	237	4
Bilton Grange & New Park	67%	2,604	1,542	253	695	661	204	307	52
Boroughbridge & Claro	57%	2,186	962	501	353	296	485	854	360
Coppice Valley & Duchy	65%	2,394	1,111	843	405	1,038	348	414	54
Fairfax & Starbeck	66%	2,500	1,496	339	654	285	667	255	2
Harlow & St. Georges	59%	2,230	1,176	658	579	576	166	139	2
High Harrogate & Kingsley	58%	2,485	1,288	613	469	964	354	365	44
Killinghall, Hampsthwaite & Saltergate	45%	1,870	998	183	492	216	24	264	30
Knaresborough East	55%	2,046	1,158	315	703	126	160	292	7
Knaresborough West	64%	2,554	1,380	597	619	374	349	336	8
Masham & Fountains	75%	2,830	1,263	854	318	1,319	209	1,934	1,080
Oatlands & Pannal	69%	2,380	1,304	451	978	331	292	195	10
Ouseburn	73%	1,882	717	389	213	49	574	1,612	1,029
Pateley Bridge & Nidderdale	71%	2,022	988	514	325	1,024	38	880	395

Table 24: Energy Efficiency retrofit measures required for dwelling below EPC Band C by North Yorkshire Council Division in Harrogate (page 2 of 2)

Division (from April 2023)	Percentage of Dwellings Below EPC Band C	Dwelling Count Below EPC Band C	Loft Insulation required	Window Glazing upgrade required	Cavity Wall Insulation required	Stone Wall insulation required	Other Wall Type insulation requried	Heating System upgrade required	Off Gas Heating System upgrade required
Ripon Minster & Moorside	● 55%	● 2,148	▲ 1,191	● 328	● 519	● 43	● 448	▦ 266	▦ 9
Ripon Ure Bank & Spa	▲ 56%	● 2,292	▲ 1,140	▲ 663	● 349	● 47	▲ 868	▦ 367	▦ 26
Spofforth with Lower Wharfedale & Tockwith	▲ 64%	● 1,916	▲ 867	● 394	● 346	● 535	● 207	▦ 801	▦ 347
Stray, Woodlands & Hookstone	◆ 68%	▲ 2,459	◆ 1,354	● 614	▲ 854	● 350	● 208	▦ 210	▦ 0
Valley Gardens & Central Harrogate	▲ 60%	◆ 3,210	▲ 1,202	◆ 1,356	● 356	◆ 1,878	● 447	▦ 855	▦ 179
Washburn & Birstwith	◆ 77%	● 2,293	▲ 979	● 483	● 421	▲ 1,062	● 72	▦ 1,594	▦ 904
Wathvale & Bishop Monkton	▲ 59%	▲ 2,445	▲ 935	● 517	● 383	● 286	● 576	▦ 1,251	▦ 690

Source: Sustenic Dwelling Level Stock Profiles 2023

Condition Indicator

For dwellings in poor condition, the improvements expected by the installation of energy efficiency measures may not be as effective if the condition issues are not dealt with first.

Using the EHS 2019 dataset, the proportion of dwellings failing disrepair (based on the former Decent Homes standard of disrepair) and with a Housing Health and Safety Rating System (HHSRS) Category 1 hazard within each tenure, dwelling age and dwelling type were applied to the Sustenic Stock Profiles in Harrogate. The results for Harrogate were then banded into quintiles to provide an indication across the authority of where clusters of dwellings in poor condition may occur.

Map 21 to Map 23 show the condition indicator, with 'Low' being areas where dwellings are least likely to be in poor condition and 'High' being areas where dwellings are most likely to be in poor condition within Harrogate.

The maps show a number of rural areas which, based on the indicator for Harrogate, may have higher levels of dwellings in poor condition. There are also areas of Harrogate and Knaresborough which may have higher levels of dwellings in poor condition.

Map 21: Condition indicator at COA level for Harrogate

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Map 22: Condition indicator at COA level for in Harrogate (Harrogate town and Knaresborough area)

Map 23: Condition indicator at COA level for Harrogate (Ripon area)
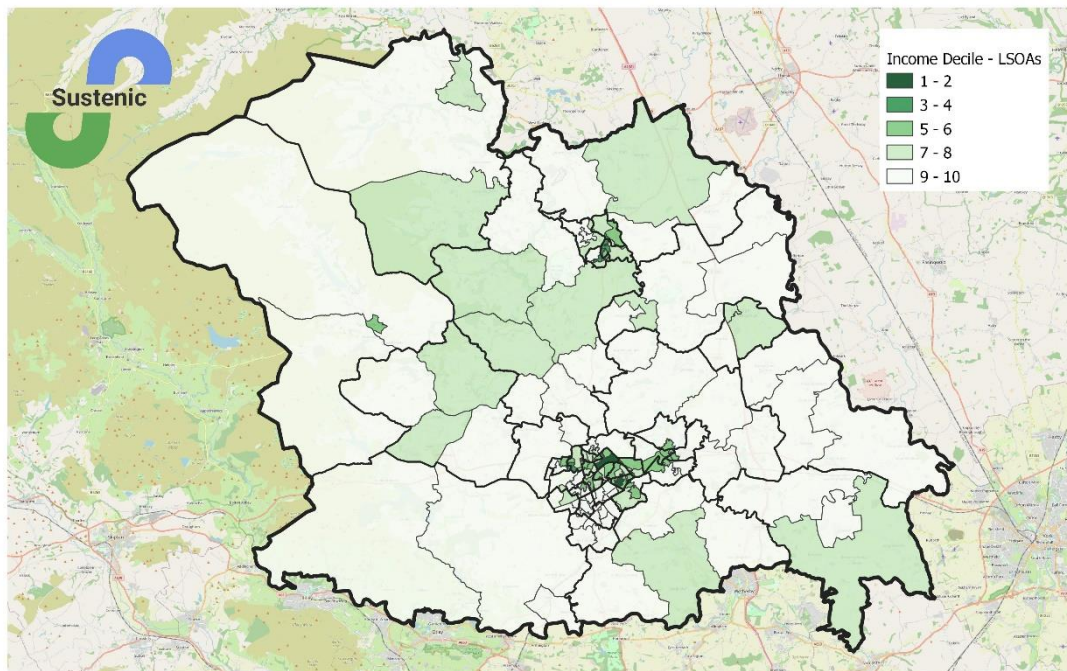
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Low Income Indicator

For a number of the funding streams available for energy efficiency improvements, funding is dependent on a household's income, designed to help those on low incomes improve their homes. The Indices of Deprivation[35] includes an income score, down to Lower Super Output Area (LSOA) which is also provided by deciles for England. Map 24 shows the income decile for England at LSOA for Harrogate.

There are two LSOAs in Harrogate within the lowest 20% for England based on the income score. These LSOAs are in Harrogate Bilton Woodfield and Harrogate Fairfax.

Map 24: Low Income Decile at LSOA level in Harrogate

Source: English indices of deprivation 2019
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Using the EHS 2019 dataset, the proportion of households with an annual income below £31,000[36] within each tenure, dwelling type and super region were applied to the Sustenic Stock Profiles in Harrogate. The results for Harrogate were then banded into quintiles to provide an indication across the authority of where clusters of households with an annual income below £31,000 may occur.
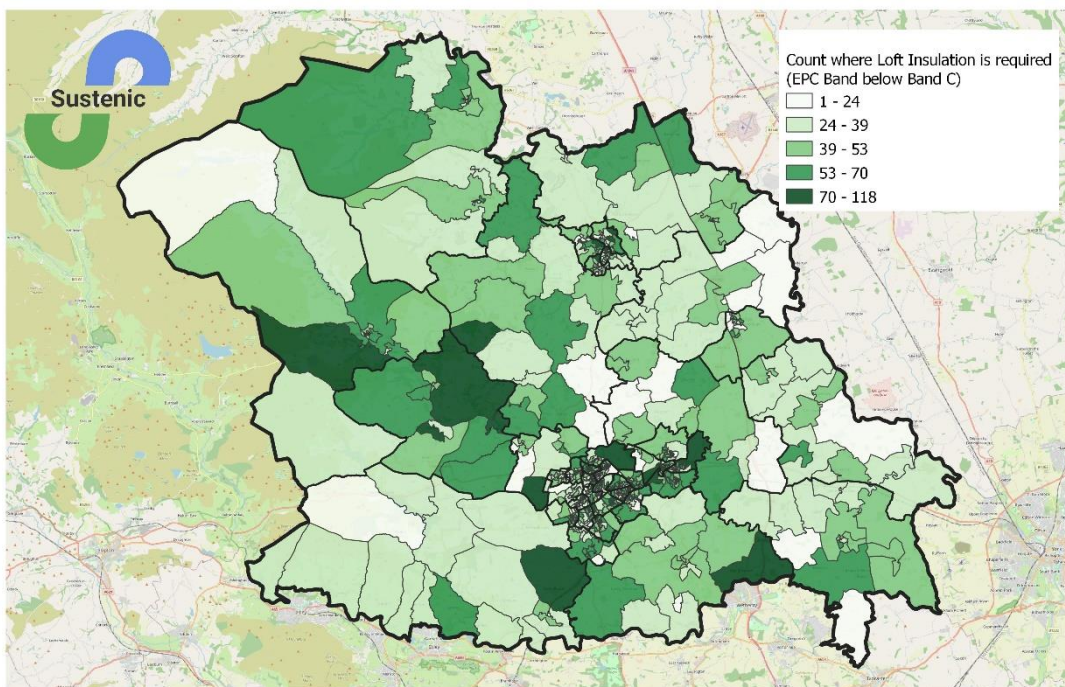
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[35] English indices of deprivation - GOV.UK (www.gov.uk)
[36] £31,000 was used as the cut of as this is the income threshold below which household can benefit from HUG funding

Map 25 to Map 27 show the low income indicator, with 'Low' being areas where households are least likely to be have an income below £31,000 and 'High' being areas where households are most likely to have an income below £31,000 within Harrogate.
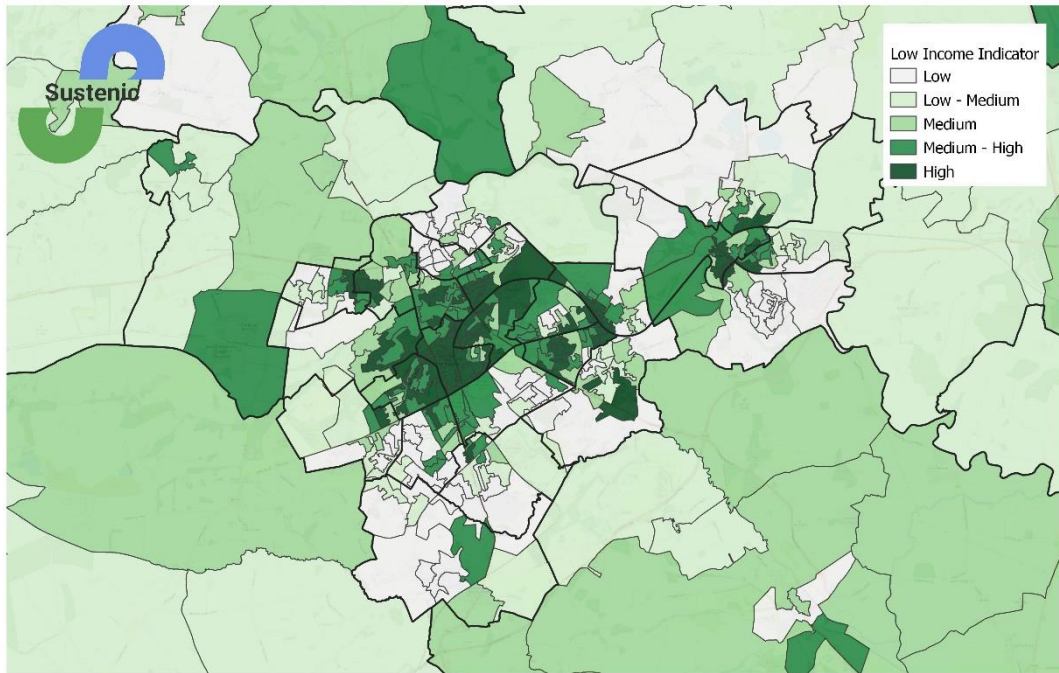
The maps show a similar pattern to the national income decile, however, the low income indicator provides information down to COA level which may help with targeting. As well as Harrogate Bilton Woodfield and Harrogate Fairfax, the low income indicator identifies further areas in Harrogate, Knaresborough and Ripon which, based on the indicator for Harrogate, may have higher levels of households with incomes below £31,000.

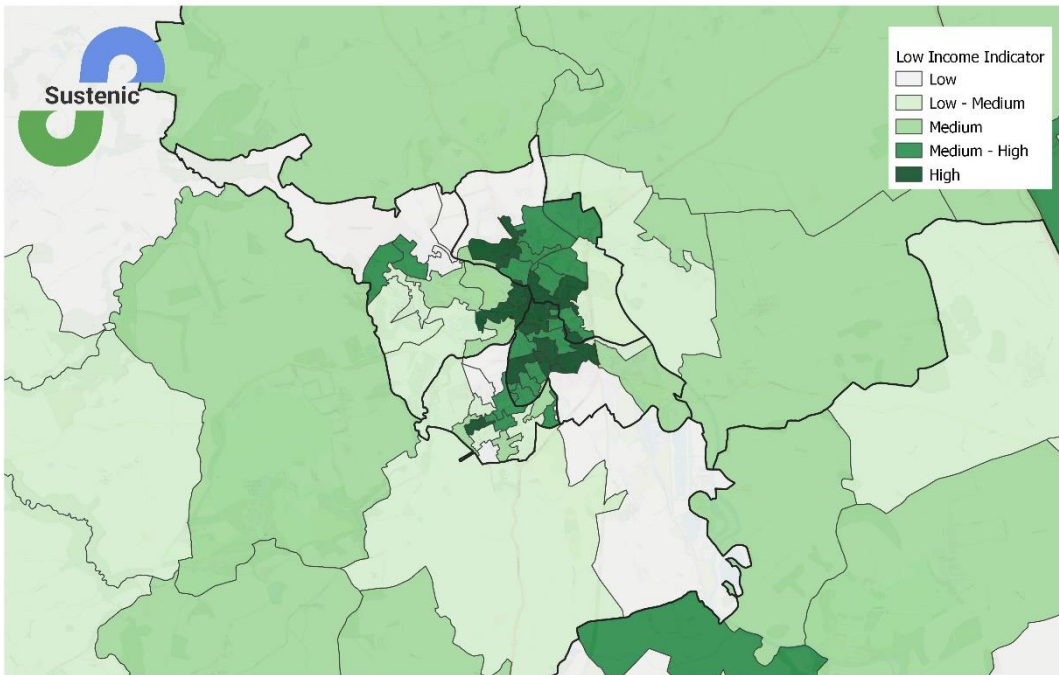*Map 25: Low Income indicator at COA level for Harrogate*

Map 26: Low Income indicator at COA level for in Harrogate (Harrogate town and Knaresborough area)

Map 27: Low Income indicator at COA level for Harrogate (Ripon area)

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Sources of funding

Home Upgrade Grant (HUG)

In Harrogate, 46,203 (59%) dwellings have an EPC Band D, E, F or G and are either owner occupied or private rented. Of these 11,987 do not use mains gas for heating. Therefore, 15% of dwellings in Harrogate meet the EPC Band, tenure and fuel requirements for HUG. Income eligibility is considered later in this section.

Map 28 to Map 30 show the count of private dwellings with an EPC Band D, E, F and G which do not use mains gas for heating. The areas with the highest number of dwellings with an EPC Band D, E, F and G which do not use mains gas for heating are distributed across Harrogate.

Map 28: Count of private dwellings with EPC Band D-G and not using mains gas for heating in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
Contains OS data © Crown copyright and database right 2017
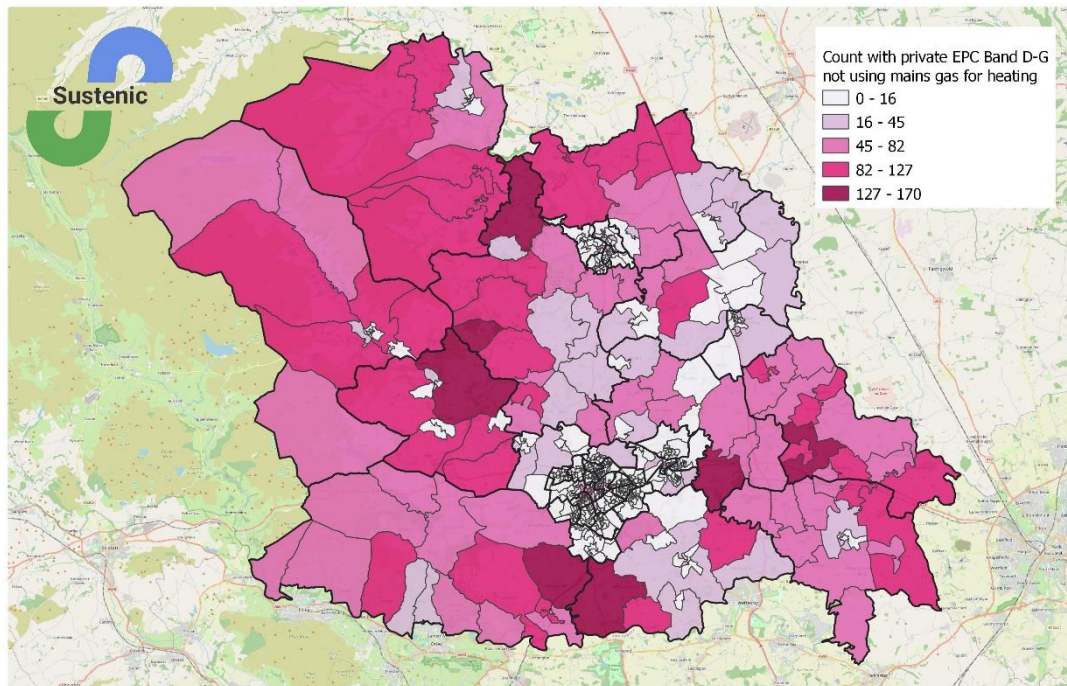© OpenStreetMap contributors

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Map 29: Count of private dwellings with EPC Band D-G and off the gas grid in Harrogate (Harrogate town and Knaresborough area)

Map 30: Count of private dwellings with EPC Band D-G and off the gas grid in Harrogate (Ripon area)

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1,283 of the dwellings with an EPC Band of D, E, F or G, which are owner occupied or private rented and do not use mains gas for heating are in the COAs which, based on the indicator for Harrogate, may have high levels of households with incomes below £31,000. A further 4,809 are in the COAs which, based on the indicator for Harrogate, may have medium to high levels of households with incomes below £31,000. The COAs these 6,092 dwellings are in, could be a sensible starting point for targeting the HUG scheme.

Map 31 to Map 33 show the count of private dwellings with an EPC Band D, E, F and G, not using mains gas for heating which, based on the indicator for Harrogate, may have medium to high levels of households with incomes below £31,000.

Map 31: Count of private dwellings with EPC Band D-G, off the gas grid where there are medium to high rates of low incomes in Harrogate

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Map 32: Count of private dwellings with EPC Band D-G, off the gas grid where there are medium to high rates of low incomes in Harrogate (Harrogate town and Knaresborough area)

Map 33: Count of private dwellings with EPC Band D-G, off the gas grid where there are medium to high rates of low incomes in Harrogate (Ripon area)

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Low Carbon Heat Ready

In Harrogate there are 19,384 (25%) dwellings which have all four of the fabric first measures (loft insulation, double/triple glazing, wall insulation and floor insulation) and are therefore potentially Low Carbon Heat Ready. 58,911 (75%) dwellings are missing one or more of the fabric first measures

The implications of this are that the majority of dwellings in Harrogate may require retrofitting before a low carbon heating system can be effective in terms of energy costs and effectively reduce carbon emissions from the residential sector

To be able to meet the net zero targets set by Government, as well as regional targets, the way homes are heated in the future will need to be through low carbon heating systems.
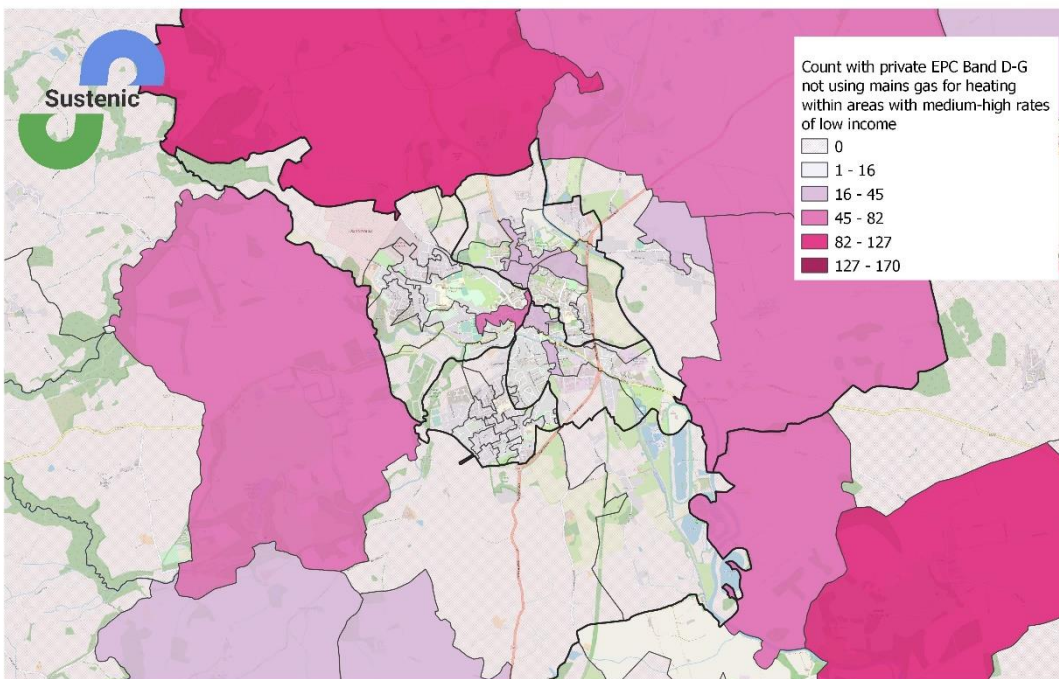
Given the current technologies available, this means installing efficient electric heating systems such as air source heat pumps, ground source heat pumps and heat networks, where these are not currently being used as the main heating system.

Heat Networks

The CCC in Homes Fit for the Future[37] identifies that heat networks are mainly suited to denser urban areas but there is no simple measurement that can be used to determine whether the larger towns in Harrogate such as Harrogate town might have areas where these would be suitable.

The CCC further states that district heating schemes may also be suited to some rural areas. It provides little detail beyond suggesting some will be suitable for off gas grid locations and might include low temperature heat networks, a clear reference to the potential for heat pumps as a heat source in such networks.

The Government's Heat Networks Investment Project (HNIP)[38] has mainly funded projects in larger cities, but Worthing in Sussex is a notable exception where a heat network will use a centralised heat pump to take heat from the sewer underneath the town.

The CCC in their most recent progress report[39] are positive about Ofgem being appointed as the heat networks regulator and providing funding through the Green Heat Networks Fund. They also point out that local authorities are to receive new powers to designate heat network

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[37] UK housing: Fit for the future? Committee on Climate Change February 2019

[38] DESNZ is currently developing the Green Heat Network Fund, which is intended to be the targeted successor to HNIP and is due to open in 2022

[39] Progress in reducing emissions 2022 Report to Parliament, Climate Change Committee June 2022

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zones where all buildings will be required to connect to the network starting with large non-residential buildings to provide the 'anchor' demand. There is also information on heat networks on the Department for Energy Security and Net Zero (DESNZ formally BEIS) Heat Networks webpages[40] including the activities of the Heat Networks Delivery Unit (HNDU) which has supported several projects in Yorkshire one of which was for Harrogate District Hospital, but as yet there are no projects including domestic dwellings. The material on the DESNZ and related websites demonstrates that designing heat networks is highly complex and they provide material on these complexities. As such, in this report we cannot give any real indication of their potential, particularly in the limited urban areas of the authority.

In rural areas however, there is considerable recent interest in what are effectively small scale heat networks mainly fuelled by ground source heat pumps. The DESNZ Heat Pump Ready Programme is funding projects[41] in both rural and urban authorities six of which appear to be focussing on identifying opportunities for deployment of ground source heat pumps arrays serving multiple properties. This technology is inherently suited to rural areas with greater access to land that can readily be excavated for installation of an array. Once again there are as yet no simple metrics by which to identify suitable properties and locations so this report cannot provide an indication of numbers of dwellings where this might be suitable. If some simple metrics should emerge from the projects it should be possible with some geospatial analysis to establish where clusters of dwellings and businesses existed that might be suited to these approaches. Such work, however, is beyond the scope of this project.

It is therefore that our main focus is the most prevalent, indeed arguably the only low carbon heating system option currently readily available – heat pumps.

Heat pumps

Low carbon heating systems options, such as air source heat pumps, run at lower temperatures than current popular heating systems, such as condensing gas boilers. Therefore, to ensure the efficiency of these low carbon heating systems, the heat demand, i.e. the energy efficiency, of a dwelling, needs to be of a high standard to ensure the low carbon heating system is able to effectively heat a dwelling. If this is not considered before the installation of a low carbon heating system, the heating system may not be effective and lead to excessively high heating bills. The main focus of this section is therefore to consider some of these fabric measures that may need to be undertaken for a low carbon heating system to work effectively.

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[40] BEIS Guidance, Heat networks
[41] Heat Pump Ready Programme: Stream 1 Phase 1 projects

Fabric First Measures

Before a low carbon heating system is considered a 'fabric first' approach needs to be considered. 'Fabric first' has been coined to refer to measures that can be applied to a dwelling to improve the energy efficiency of the building envelope.   The better the efficiency of the building envelope, the less heat loss there is from a building, therefore keeping the heat demand of a dwelling to a minimum.

The measures considered when referring to 'fabric first' in relation to a dwelling being suitable for a low carbon heating system and therefore Low Carbon Heat Ready (LCHR) are:

1. Loft Insulation
2. Double/triple glazing
3. Wall Insulation
4. Floor Insulation

Table 25 to Table 28 show the number and percentage of dwellings with each of the fabric first measures.

There are 49,745 (64%) dwellings in Harrogate with existing loft insulation of 200mm or more or where there is no loft. 28,550 (36%) would require additional loft insulation before the loft would meet the fabric first requirement for LCHR.

Table 25: Fabric First Measure for LCHR – Loft Insulation, in Harrogate

Loft Insulation	Number of Dwellings	Per cent
Loft LCHR (with 200mm+ of Insulation or No Loft)	49,745	64%
Loft Insulation required	28,550	36%
All Dwellings	78,295	-

Source: Sustenic Dwelling Level Stock Profiles 2023

There are 66,067 (84%) dwellings in Harrogate with full double or triple glazing. 12.228 (16%) would require improvements to the windows before the windows would meet the fabric first requirement for LCHR.

Table 26: Fabric First Measure for LCHR – Window glazing, Harrogate

Windows	Number of Dwellings	Per cent
Windows LCHR (Full Double Glazing or Triple Glazing)	66,067	84%
Window improvement required	12,228	16%
All Dwellings	78,295	-

Source: Sustenic Dwelling Level Stock Profiles 2023

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There are 45,629 (58%) dwellings in Harrogate with full wall insulation. 32,666 (42%) would require wall insulation before the walls would meet the fabric first requirement for LCHR.

Table 27: Fabric First Measure for LCHR – Wall Insulation, in Harrogate

Walls	Number of Dwellings	Per cent
Walls LCHR (Fully insulated)	45,629	58%
Wall insulation required	32,666	42%
All Dwellings	**78,295**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

There are 27,886 (36%) dwellings in Harogate with floor insulation or limited floor insulation. 50,409 (64%) would require floor insulation before the walls would meet the fabric first requirement for LCHR.

Table 28: Fabric First Measure for LCHR – Floor Insulation, in Harrogate

Floors	Number of Dwellings	Per cent
Floors LCHR (insulated, limited insulation or dwelling below)	27,886	36%
Floor insulation required	50,409	64%
All Dwellings	**78,295**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

These measures in combination can give an indication of whether a dwelling would meet the fabric first requirements for a low carbon heating system.

Table 29 shows the number and percentage of dwellings which have all four fabric first measures. In Harrogate there are 19,384 (25%) dwellings which have all four of the fabric first measures and are therefore potentially LCHR. 58,911 (75%) dwellings are missing one or more of the fabric first measures.

Table 29: LCHR - Fabric First Measure in Harrogate

LCHR fabic first measures	Number of Dwellings	Per cent
LCHR - has all fabic first measures	19,384	25%
Missing one or more fabric first measure	58,911	75%
All Dwellings	**78,295**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

Map 34 to Map 36 show the counts of dwellings having all four fabric first measures and are therefore potentially low carbon heat ready. These maps show that the number of dwellings which are potentially low carbon heat ready are lower in the rural areas. The areas with the highest number of potentially low carbon heat ready dwellings are in Bishop Monkton & Newby, Killinghall & Hampsthwaite and Knaresborough Scriven Park.

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Map 34: Count of dwellings which are potentially Low Carbon Heat Ready at COA level in Harrogate

Map 35: Count of dwellings which are potentially Low Carbon Heat Ready at COA level in Harrogate (Harrogate town and Knaresborough area)

© Sustenic Limited

Map 36: Count of dwellings which are potentially Low Carbon Heat Ready at COA level in Harrogate (Ripon area)

Floor Insulation

Floor insulation is the most recent of the 'fabric first' measures to be included in building regulations. This means that only the most modern dwellings (post 2006) or dwellings which have undergone significant renovations are likely to have floor insulation. Retrofitting floor insulation is not always straightforward, can be disruptive to a household and incur additional cost, for example costs of new flooring or a new kitchen where these need to be removed to access the floor.

If a dwelling is sufficiently energy efficient without floor insulation it may be deemed acceptable for installation of a low carbon heating system.

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Table 30 shows the number and percentage of dwellings which have the three other fabric first measures but no floor insulation.

Accepting dwellings without floor insulation as being low carbon heat ready would increase the number of dwellings in Harrogate as potentially LCHR to 32,687 (42%). 45,608 (58%) dwellings are missing one or more of the fabric first measures (aside from floor insulation).

Table 30: LCHR - Fabric First Measure (not including floor insulation) in Harrogate

LCHR (not including floor insulation)	Number of Dwellings	Per cent
LCHR - Loft, Windows and Walls	32,687	42%
Loft insulation and/or Window improvement and/or Wall insulation required	45,608	58%
All Dwellings	**78,295**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

Map 37 to Map 39 show the counts of dwellings that have all three of these fabric first measures. These maps show that the number of dwellings which are potentially low carbon heat ready (excluding floor insulation) are still lower in the rural areas, however, these maps show a wider distribution of dwellings which may have sufficient energy efficiency levels for a low carbon heating system to be effective.

Map 37: Count of dwellings which are potentially Low Carbon Heat Ready (if floor insulation is not required) at COA level in Harrogate
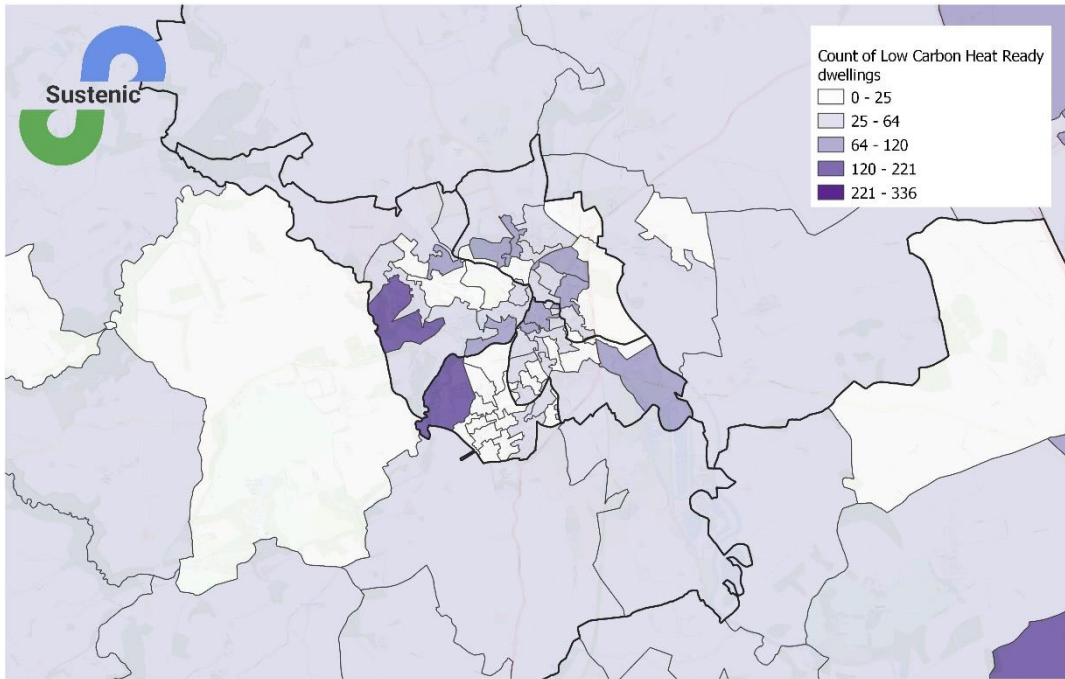

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
Contains OS data © Crown copyright and database right 2017
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Map 38: Count of dwellings which are potentially Low Carbon Heat Ready (if floor insulation is not required) at COA level in Harrogate (Harrogate town and Knaresborough area)

Map 39: Count of dwellings which are potentially Low Carbon Heat Ready (if floor insulation is not required) at COA level in Harrogate (Ripon area)

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Basic measures

Where a dwelling has a small external wall area, such as a smaller mid terrace dwelling, these may be sufficiently energy efficient for a low carbon heat system to be effective, with only the basic insulation measures of loft insulation and double or triple glazing. Table 31 shows the number of dwellings which have the basic fabric measures by dwelling type.

There are 43,696 (56%) dwellings which have both loft insulation and double/triple glazing. 4,480 of these are mid terrace and 9,831 are flats. Where the external wall areas (and associated heat loss) are small for these dwellings, the energy efficiency may be sufficient for a low carbon heating system to be effective.

Table 31: LCHR - Basic Measure (Loft Insulation and Double/Triple Glazing) in Harrogate

LCHR (Basic measures only) by Dwelling Type	Number of Dwellings
Detached	14,813
Semi-detached	11,288
End Terrace	3,270
Mid Terrace	4,480
Flat	9,831
Park Home	14
All Dwellings	**43,696**

Source: Sustenic Dwelling Level Stock Profiles 2023

Ward and Division level summary

Table 32 and Table 33 provide summaries of the Low Carbon Heat Ready indicators in Harrogate at ward (before April 2023) and division level respectively.

The wards with the highest proportion of dwellings with all four fabric measures is Killinghall & Hampsthwaite (51%).

If we accept that dwellings without floor insulation are low carbon heat ready, the wards with the highest proportion of dwellings meeting these requirements are Killinghall & Hampsthwaite (63%), Boroughbridge (60%), and Bishop Monkton & Newby (59%).

Of those with basic measures, the two wards with the highest proportion of dwellings with both sufficient loft insulation and window glazing are Killinghall & Hampsthwaite (72%) and Bishop Monkton & Newby (70%).

The division (from April 2023) with the highest proportion of dwellings with all four fabric measures is Boroughbridge & Claro (37%).

If we accept that dwellings without floor insulation are low carbon heat ready, the divisions with the highest proportion of dwellings meeting these requirements are Killinghall, Hampsthwaite & Saltergate (55%) and Wathvale & Bishop Monkton (56%).

Of those with basic measures, the divisions with both sufficient loft insulation and window glazing at the highest levels are Killinghall, Hampsthwaite & Saltergate (63%), Ouseburn (64%) and Wathvale & Bishop Monkton (68%)

Table 32: Low Carbon Heat Ready, Fabric First Measures by Ward in Harrogate (before April 2023) (page 1 of 3)

Ward	Number of Dwellings	Low Carbon Heat Ready (LCHR) All fabric first measures	Percentage LCHR	LCHR Floor insulation not included	Percentage LCHR Floor insulation not included	LCHR Basic Measures only	Percentage LCHR Basic Measures only
Bishop Monkton & Newby	2,087	815	39%	1,223	59%	1,469	70%
Boroughbridge	2,002	889	44%	1,202	60%	1,327	66%
Claro	1,801	502	28%	768	43%	1,037	58%
Fountains & Ripley	1,989	534	27%	779	39%	1,093	55%
Harrogate Bilton Grange	1,914	42	2%	464	24%	778	41%
Harrogate Bilton Woodfield	2,102	265	13%	788	37%	1,268	60%
Harrogate Central	2,856	806	28%	935	33%	1,637	57%
Harrogate Coppice Valley	2,167	353	16%	538	25%	980	45%
Harrogate Duchy	1,505	535	36%	688	46%	901	60%
Harrogate Fairfax	2,098	210	10%	727	35%	994	47%
Harrogate Harlow	1,732	310	18%	699	40%	873	50%
Harrogate High Harrogate	2,160	450	21%	572	26%	1,138	53%
Harrogate Hookstone	1,562	271	17%	677	43%	798	51%
Harrogate Kingsley	2,116	713	34%	1,032	49%	1,230	58%
Harrogate New Park	1,978	459	23%	854	43%	1,159	59%
Harrogate Oatlands	1,805	176	10%	472	26%	784	43%
Harrogate Old Bilton	1,545	183	12%	654	42%	763	49%

Table 30: Low Carbon Heat Ready, Fabric First Measures by Ward in Harrogate (before April 2023) (page 2 of 3)

Ward	Number of Dwellings	Low Carbon Heat Ready (LCHR) All fabric first measures	Percentage LCHR	LCHR Floor insulation not included	Percentage LCHR Floor insulation not included	LCHR Basic Measures only	Percentage LCHR Basic Measures only
Harrogate Pannal	1,629	428	26%	679	42%	950	58%
Harrogate Saltergate	2,121	453	21%	1,001	47%	1,160	55%
Harrogate St Georges	2,029	597	29%	829	41%	1,073	53%
Harrogate Starbeck	1,703	253	15%	575	34%	848	50%
Harrogate Stray	2,054	252	12%	567	28%	895	44%
Harrogate Valley Gardens	2,455	459	19%	571	23%	1,257	51%
Killinghall & Hampsthwaite	2,001	1,027	51%	1,270	63%	1,449	72%
Knaresborough Aspin & Calcutt	1,789	281	16%	692	39%	909	51%
Knaresborough Castle	2,191	589	27%	948	43%	1,166	53%
Knaresborough	1,726	382	22%	858	50%	1,019	59%
Knaresborough Scriven Park	1,963	697	36%	1,054	54%	1,202	61%
Marston Moor	1,940	664	34%	1,053	54%	1,244	64%
Masham & Kirkby Malzeard	1,735	300	17%	550	32%	875	50%
Nidd Valley	1,983	546	28%	766	39%	1,111	56%
Ouseburn	1,899	688	36%	1,059	56%	1,219	64%
Pateley Bridge & Nidderdale Moors	1,937	413	21%	628	32%	961	50%
Ripon Minster	2,040	563	28%	983	48%	1,165	57%
Ripon Moorside	1,883	343	18%	983	52%	1,115	59%
Ripon Spa	2,047	609	30%	1,066	52%	1,222	60%

Table 30: Low Carbon Heat Ready, Fabric First Measures by Ward in Harrogate (before April 2023) (page 3 of 3)

Ward	Number of Dwellings	Low Carbon Heat Ready (LCHR) All fabric first measures	Percentage LCHR	LCHR Floor insulation not included	Percentage LCHR Floor insulation not included	LCHR Basic Measures only	Percentage LCHR Basic Measures only
Ripon Ure Bank	2,010	667	33%	935	47%	1,126	56%
Spofforth with Lower Wharfedale	1,736	501	29%	714	41%	1,013	58%
Washburn	1,949	521	27%	752	39%	1,158	59%
Wathvale	2,056	638	31%	1,082	53%	1,330	65%

Source: Sustenic Dwelling Level Stock Profiles 2023

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Table 33: Low Carbon Heat Ready, Fabric First Measures by North Yorkshire Council Division in Harrogate (page 1 of 2)

Division (From April 2023)	Number of Dwellings	Low Carbon Heat Ready (LCHR) All fabric first measures	Percentage LCHR	LCHR Floor insulation not included	Percentage LCHR Floor insulation not included	LCHR Basic Measures only	Percentage LCHR Basic Measures only
Bilton & Nidd Gorge	3,647	448	12%	1,442	40%	2,031	56%
Bilton Grange & New Park	3,892	501	13%	1,318	34%	1,937	50%
Boroughbridge & Claro	3,803	1,391	37%	1,970	52%	2,364	62%
Coppice Valley & Duchy	3,672	888	24%	1,226	33%	1,881	51%
Fairfax & Starbeck	3,801	463	12%	1,302	34%	1,842	48%
Harlow & St. Georges	3,761	907	24%	1,528	41%	1,946	52%
High Harrogate & Kingsley	4,276	1,163	27%	1,604	38%	2,368	55%
Killinghall, Hampsthwaite & Saltergate	4,122	1,480	36%	2,271	55%	2,609	63%
Knaresborough East	3,689	1,079	29%	1,912	52%	2,221	60%
Knaresborough West	3,980	870	22%	1,640	41%	2,075	52%
Masham & Fountains	3,750	841	22%	1,340	36%	1,981	53%
Oatlands & Pannal	3,434	604	18%	1,151	34%	1,734	50%
Ouseburn	2,565	872	34%	1,382	54%	1,635	64%
Pateley Bridge & Nidderdale	2,846	697	24%	1,042	37%	1,503	53%

Table 34: Low Carbon Heat Ready, Fabric First Measures by North Yorkshire Council Division in Harrogate (page 2 of 2)

Division (From April 2023)	Number of Dwellings	Low Carbon Heat Ready (LCHR) All fabric first measures	Percentage LCHR	LCHR Floor insulation not included	Percentage LCHR Floor insulation not included	LCHR Basic Measures only	Percentage LCHR Basic Measures only
Ripon Minster & Moorside	3,923	906	23%	1,966	50%	2,280	58%
Ripon Ure Bank & Spa	4,057	1,276	31%	2,001	49%	2,348	58%
Spofforth with Lower Wharfedale & Tockwith	3,010	981	33%	1,444	48%	1,841	61%
Stray, Woodlands & Hookstone	3,616	523	14%	1,244	34%	1,693	47%
Valley Gardens & Central Harrogate	5,311	1,265	24%	1,506	28%	2,894	54%
Washburn & Birstwith	2,997	776	26%	1,093	36%	1,714	57%
Wathvale & Bishop Monkton	4,143	1,453	35%	2,305	56%	2,799	68%

Source: Sustenic Dwelling Level Stock Profiles 2023

Hard to Decarbonise

In Harrogate 19,001 dwellings are within conservation areas and 1,399 dwellings were identified as Grade II listed. Furthermore, 19,440 have stone or solid walls which are uninsulated and 786 rooms in roofs which need insulation which are both features which are hard to treat

The implications of dwellings in conservation areas, that are Grade II listed and have hard to treat features are that retrofitting them can be more expensive and take longer, as well as having to comply with strict regulations

Research for the Committee on Climate Change developed an approach to homes which could be considered 'hard to decarbonise'. These were home that are 'hard to treat' and/or do not have cost-effective options of low carbon heating. Factors considered relevant included the following[42]:

Physical attributes

- Wall Type
  - Solid walls
  - Hard to fill cavity walls
    - Narrow cavity (< 50 mm)
    - Prefab concrete cavity
    - Metal frame cavity
    - Stone cavity
    - Light weight timber frame
    - Partially filled cavity
    - Cavity >4 storeys tall (e.g. narrow)
- Roof type
  - No loft (or not accessible)
  - Flat roof homes
- Property type
  - High-rise flats
  - Tenement
  - Heritage building
- Construction
  - Bespoke features
  - Park home
  - Steel framed (BISF)
- Size
  - Space constrained homes

Consumer attributes

- Tenure type
- Household income and socio-economic group

Local attributes

- Non availability of heat network
- Non availability of gas grid
- Conservation area
- Location with extreme exposure

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[42] Analysis on abating direct emissions from 'hard-to-decarbonise' homes (Element Energy & UCL) - Climate Change Committee (theccc.org.uk)

Some of the hard to decarbonise factors have been provided earlier in this report, for example, the low income indicator. Others are too detailed for us to be able to provide further information, for example, metal frame cavity, which would require a detailed survey to determine. Where information is available for the factors above these have been discussed below.

Physical Attributes

The physical attributes highlight factors which may affect the ease of installation and/or cost of retrofit measures.

Information on wall type, roof type and property type have been provided below. The more detailed information on hard to treat cavity walls, non accessible lofts, tenements, bespoke features, park homes, steel frames and size constraints, are not currently available and are therefore not included in the analysis.

Wall Type

Table 35 shows the number and percentage of dwellings by wall type. 51.556 (66%) dwellings have cavity walls. 15,371 (20%) dwellings have stone walls. 7,441 (9%) dwellings have solid walls The other 3,927 dwellings are system built[43], timber frame or park homes, as well as 10 cob constructed[44] dwellings.

Table 35: Number and percentage of dwellings by wall type in Harrogate

Wall Types	Number of Dwellings	Per cent
Cavity Walls	51,556	66%
Solid Walls	7,441	9%
Stone Walls	15,371	20%
Timber	2,671	3%
System Built	1,234	2%
Park Homes	12	0%
Cob	10	0%
All Dwellings	**78,295**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 36 shows the number and percentage of dwellings by wall type and insulation. 45,626 (58%) dwellings have wall insulation. Of the 32,669 (42%) dwellings which are uninsulated or only partially insulated, 11,760 of these are cavity wall. More data would need to be collected to determine if any of these cavity walls would be hard to treat.

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[43] What are system-built homes? | Ritz-Craft
[44] Cob Building Systems – Foundations and Walls - This Cob House

12,902 of the uninsulated or only partially insulated dwellings are stone walls and 6,538 are solid walls. These would be considered hard to treat as these would require external or internal wall insulation which is more expensive compared to cavity wall insulation. 629 are timber frame and 822 are system built, however, more data would be required to determine if any of these are light weight timber frame or prefab concrete cavity.

Table 36: Number and percentage of dwellings by wall type and insulation in Harrogate

Wall Types	Insulated	Per cent	Uninsulated or partially insulation	Per cent
Cavity Walls	39,796	77%	11,760	23%
Solid Walls	903	12%	6,538	88%
Stone Walls	2,469	16%	12,902	84%
Timber	2,042	76%	629	24%
System Built	412	33%	822	67%
Park Homes	4	33%	8	67%
Cob	-	0%	10	100%
All Dwellings	**45,626**	**58%**	**32,669**	**42%**

Source: Sustenic Dwelling Level Stock Profiles 2023

Roof Type

Table 37 shows the number and percentage of dwellings by loft type and insulation. For those where loft type information is available, 8,318 have no loft, however, as most of these have a dwelling above they are not considered as needing loft insulation. 1,772 dwellings have a room in the roof. These can be hard to treat as loft insulation would be required beneath the plaster between the rafters. Of these only 786 require loft insulation.

Table 37: Number and percentage of dwellings by loft type and insulation in Harrogate

Loft Type	Insulated (200mm or more) or Dwelling above	Per cent	Loft Insulation required	Per cent
No Loft	8,318	100%	-	0%
Pitched	30,195	53%	27,276	47%
Flat	157	29%	382	71%
Room in roof	1,772	69%	786	31%
Thatched	9	100%	-	0%
Unknown	9,294	99%	106	1%
All Dwellings	**49,745**	**64%**	**28,550**	**36%**

Source: Sustenic Dwelling Level Stock Profiles 2023

Property Type

High-rise flats

High-rise flats often face unique challenges when it comes to retrofitting energy efficiency measures and installing low carbon heating required for decarbonisation. The lack of access to external walls and roofs can make it difficult to install solar panels and other renewable energy technologies. It can also be difficult to engage all the residents and landlords to agree to energy efficiency initiatives in a shared building.

High-rise flats are considered to be buildings of 18 metres or more in height, or more than 6 storeys (whichever is reached first)[45]. Using the OS MasterMap Building Height dataset, buildings over 18 metres with more than 4 flats were identified.

There are 14,731 flats in Harrogate. 37 residential buildings in Harrogate were identified being 18 meters or higher with more than 4 flats. Within these 37 buildings there are 719 flats collectively, which account for 5% of the flats in Harrogate. Despite only 719 of the flats in Harrogate being within high rise buildings, other flats may still have some of the same issues when it comes to retrofitting, especially for those within shared buildings

Heritage/Listed buildings

Buildings of architectural or historical significance may also have tighter restrictions on changes allowed to a building to ensure they are protected for future generations. These could apply to the interior of the dwelling as well as its external appearance. Probably the most relevant example is internal wall insulation. As it is the whole of the building which is listed this may not be allowed in listed buildings. The local planners[46] were not able to provide any fixed guidelines on what was likely to be allowed stating that both internal wall and floor insulation might require listed building consent and the varied nature of listed buildings means that each case would need to be decided on its merits.

In Harrogate there are a total of 2,279[47] listings. The listings cover both domestic and non-domestic buildings, as well as other structures such as monuments. The listings vary in the number of buildings/structures they refer to. Buildings listed can contain multiple dwellings (i.e. flats).

Simple analysis of the listings data was carried out to identify which of the listings correspond to domestic buildings (for example, house numbers or text identifiers such as 'house'/'cottage'). The listings were then analysed to identify multiple properties to provide an estimate of the number of listed dwellings in Harrogate. Table 38 shows the results of this

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[45] Building Safety Programme: estimates of EWS1 requirements on residential buildings in England - GOV.UK (www.gov.uk)

[46] Local planners from the Yorkshire Dales National Park were consulted during the course of a separate project with a neighbouring authority who also had housing stock in the national park.

[47] Download Listing Data - GIS Shapefiles | Historic England

analysis and a breakdown of the grading for these dwellings[48]. From this analysis 1,426 dwellings were identified as being listed, with 1,339 being grade II listed and 20 being grade II* listed.

Table 38: Number of Listed buildings and dwellings by grading in Harrogate

Listed Buildings		Harrogate
Number of listings		2,279
Number of listings (domestic)		959
Number of listed dwellings		1,426
Grade of listed dwelling	I	7
	II	1,399
	II*	20
	Total	1,426

Source: Sustenic Dwelling Level Stock Profiles 2023

Space Constraints

For dwellings requiring solid wall insulation, installing external wall insulation where the dwelling is facing directly onto roads or paths may risk legal action by the owner of the road or path as the insulation would be considered to oversail the land. Where the owner is the highways authority a licence can be sought from the authority but there is no obligation on the authority to provide such a licence and if it does it can charge reasonable costs, thereby introducing additional legislative, administrative and cost considerations.

There are a number of situations where external wall insulation could potentially cause oversailing to take place. The common examples include; where any front face of a dwelling fronts onto a footpath, where the side face of a dwelling is directly adjacent to a footpath, where there is a passageway between dwellings.

Spatial analysis has been carried out using OS MasterMap to identify dwellings which have external walls next to roads or paths. In Harrogate this analysis identified 10,986 (14%) dwellings with this feature.

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[48] To get a more accurate figure of the number of listed dwellings use of the OS MasterMap to carry out spatial analysis of the data is advised.

Table 39 shows the number and percentage of dwellings onto roads and paths by wall type. 4,337 (39%) of dwellings onto roads and paths are cavity wall and therefore oversailing would not be an issue when installing cavity wall insulation. 3,793 (35%) dwellings onto roads and paths are stone wall and a further 2,346 (21%) are solid wall. For these 6,139 dwellings, which account for 8% of dwellings in Harrogate, EWI may not be possible.
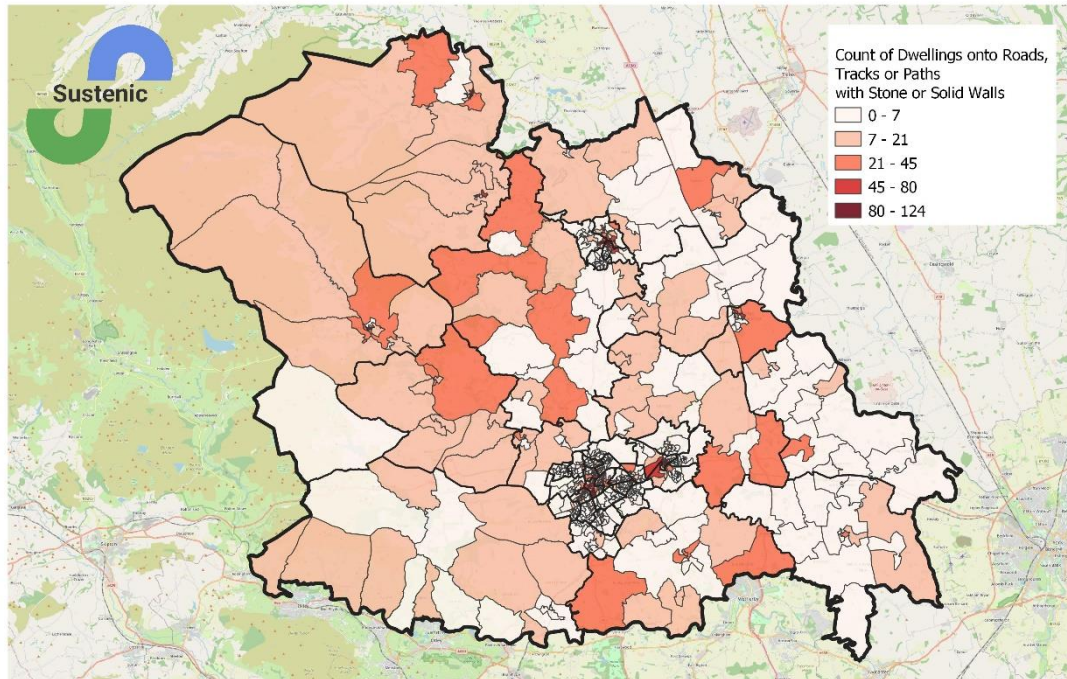
Table 39: Number of dwellings directly fronting onto roads and paths by wall type in Harrogate

Wall Type	Number of Dwellings onto a Road or Path	Per cent of Dwellings onto a Road or Path
Cavity Walls	4,337	39%
Solid Walls	2,346	21%
Stone Walls	3,793	35%
Timber	331	3%
System Built	175	2%
Park Homes	-	0%
Cob	4	0%
All Dwellings onto a Road or Path	**10,986**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Map 40 to Map 42 show the counts of dwellings directly fronting onto roads, tracks or paths with either stone or solid walls. The areas with the highest number of dwellings directly fronting onto roads, tracks or paths with either stone or solid walls are in Harrogate, Knaresborough and Ripon.

Map 40: Count of Dwellings directly fronting onto a Road, Track or Path with Stone or Solid Walls at COA level in Harrogate

Source: Sustenic Dwelling Level Stock Profiles 2023
Contains Energy Performance of Buildings Data: England and Wales
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Map 41: Count of Dwellings directly fronting onto a Road, Track or Path with Stone or Solid Walls at COA level in Harrogate (Harrogate town and Knaresborough area)

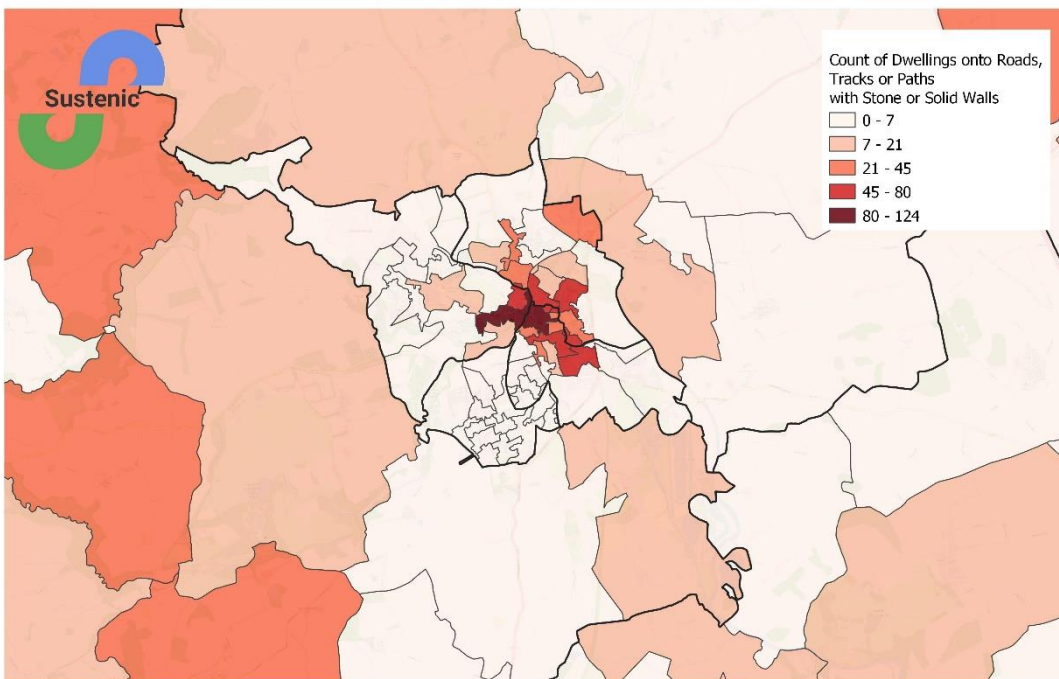*Map 42: Count of Dwellings directly fronting onto a Road, Track or Path with Stone or Solid Walls at COA level in Harrogate (Ripon area)*

Consumer Attributes

In this section consumer attributes which may affect the ease of installation of retrofit measures are considered. These include responsibility for measures and in particular, the impact of tenure, as well as considering who may or may not be able to afford the cost of these measures.

Information on tenure and household income has been provided below. Other up to date information on socio-economic status is not currently available for this project and is therefore not included in the analysis. When the 2021 census data is released this should fill this gap in the data.

Tenure

Tenure has been discussed previously in the report (see section on Tenure). In Harrogate 55,625 (71%) dwellings are owner occupied, 15,269 (20%) are privately rented and 7,401 (9%) are social housing.

Compared to the tenure distribution in England, the proportion of privately rented dwellings in Harrogate at 20% is higher compared to England at 18%. Harrogate has a higher proportion of owner occupied dwellings, 71% compared to 65% in England. The proportion of social rented dwellings is lower in Harrogate, 9% compared to 17% in England.

The tenure of the household within a dwelling will affect who is responsible for decisions on energy efficiency improvements, for example, owner occupiers will make the decision on their own dwelling, whereas for private rented dwellings the landlord would be the decision maker. In general, social rented dwellings tend to have higher levels of energy efficiency. There are many reasons for this including their stock being generally more modern and therefore inherently more efficient, but it has also been very effectively targeted for retrofit schemes by both the social landlords themselves and the retrofit industry.

With a higher proportion of owner occupied dwellings in Harrogate compared to nationally, improving energy efficiency in Harrogate will require targeted initiatives to incentivise homeowners to upgrade their properties

Household Income

For a number of the funding streams available for energy efficiency improvements, funding is dependent on a household's income, designed to help those on low incomes improve their homes. The low income decile from the Indices of Deprivation and a low income indicator for Harrogate have been provided earlier in the report (see section Low Income Indicator).

There are two LSOAs in Harrogate within the lowest 20% for England based on the income score. These LSOAs are in Harrogate Bilton Woodfield and Harrogate Fairfax.

As well as Harrogate Bilton Woodfield and Harrogate Fairfax, the low income indicator identifies further areas in Harrogate, Knaresborough and Ripon which, based on the indicator for Harrogate, may have higher levels of households with incomes below £31,000.

Local Attributes

The local attributes highlight factors which may affect the installation of certain measures due to the location of the dwelling. This could be for example where a dwelling cannot have a gas central heating system because it is off the gas grid or where localised planning constraints such as conservation areas might prevent measures such as external solid wall insulation. Extreme exposure is another such localised attribute which might prevent for example cavity wall insulation. Regrettably information on locations with extreme exposure is currently unavailable for this project and is therefore not included in the analysis.

Non availability of heat network

Heat networks have been discussed previously in the report (see section on Heat Networks).

Non availability of gas grid

Of the 7,940 postcodes in Harrogate, 1,851[49] are off the gas grid. There are 7,970 (10%) dwellings off the gas grid in Harrogate.

Map 43 to Map 45 show the percentage of postcodes at COA level which are off the gas grid. The rural areas of Harrogate have the highest proportion of postcodes off the gas grid. The urban areas have no or lower proportions of postcodes off the gas grid.

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[49] off-gas-postcodes-v2.xlsx (live.com)

Map 43: Percentage of postcodes off the gas network at COA level in Harrogate

Source: Xoserve 2017
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Contains National Statistics data © Crown copyright and database right 2017
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Map 44: Percentage of postcodes off the gas network at COA level in Harrogate (Harrogate town and Knaresborough area)

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Map 45: Percentage of postcodes off the gas network at COA level in Harrogate (Ripon area)

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Conservation areas

Dwellings within conservation areas will have restrictions on alterations to the appearance of the dwelling, which may impact on the retrofit measures which can be applied to dwellings within these areas.

The main impact is likely to be on the potential for applying external wall insulation or installing UPVC double glazed windows (instead of more expensive timber framed windows).

Map 46 to Map 48 show the conservation areas within Harrogate.

There are 19,007 (24%) dwellings within the conservation areas across Harrogate.

Map 46: Conservation areas in Harrogate

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Map 47: Conservation areas in Harrogate (Harrogate town and Knaresborough area)

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Map 48: Conservation areas in Harrogate (Ripon area)

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Retrofit Costs

In Harrogate £1,250 million of funding is required to retrofit Fabric First measures where these are not already present. To decarbonise the heating of the stock a further £1,093 million would be required to install heat pumps, storage heaters and/or solar PV where possible

Retrofitting 14,619 dwellings in conservation areas in Harrogate with Fabric First measures would require funding levels of around £616 million. This figure is only just below the £634 million funding needed for the 44,292 dwellings not in conservation areas in Harrogate

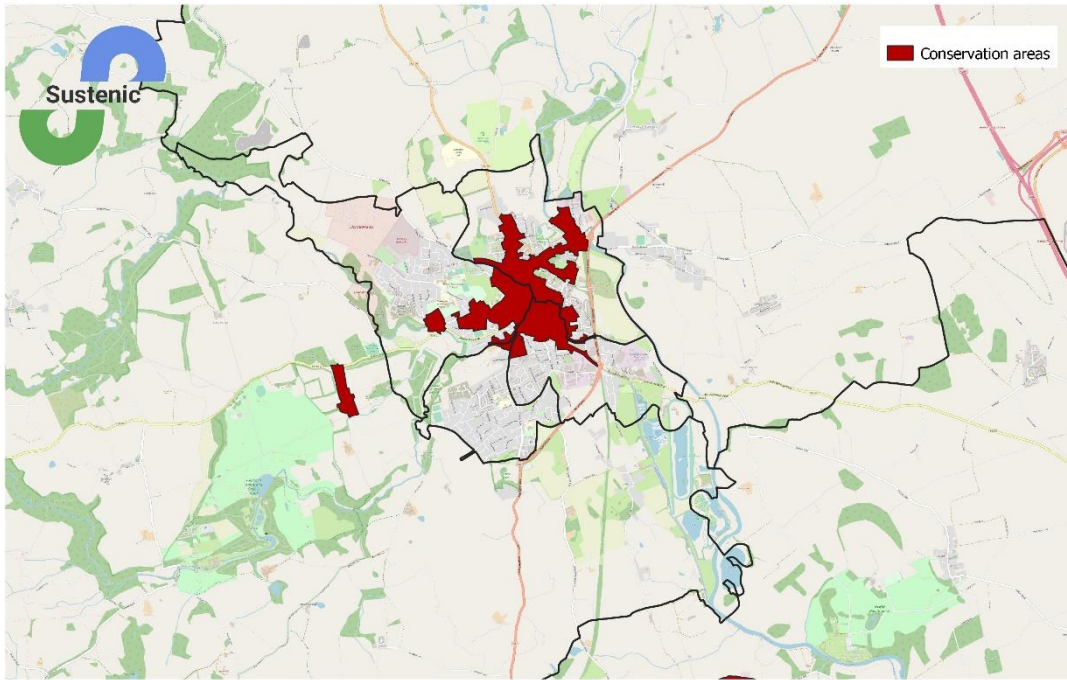By understanding the costs associated with retrofitting, local authorities can make informed decisions about which retrofitting measures to prioritise, as well as which funding and resources are suitable to complete the retrofitting. For local authorities to be successful in transitioning to net zero emissions, they must have a comprehensive understanding of the costs associated with energy efficiency retrofits. This understanding is essential to ensure that the transition is cost-effective and that the necessary resources are available to complete the retrofitting process.

A retrofit cost model has been developed drawing upon national sources of evidence, to assign costs to the common retrofit measures of interest.

Using the various cost assumptions made by Climate Change Committee's (CCC) Sixth Carbon Budget as a base, this has been expanded to develop a simple cost model which can be used at an individual dwelling and a whole stock level.

The stages in developing the cost model are:

1. Decide on measures required
2. Lookup cost measures required by build type and size
3. Heritage uplift percentage
4. Local labour cost uplift
5. Inflation uplift
6. Economies of Scale
7. Condition contingencies uplift
8. Scaffolding costs
9. Survey design and planning costs
10. Inflation uplift to (preliminary) overheads
11. Uplift for general overheads and profit
12. Future inflation uplift

Details on each of these factors can be found in Appendix 2 – Retrofit Cost Model.

There are three sets of possible retrofit packages which have been modelled. Each measure, and therefore the associated cost, is only applied where applicable for each dwelling. These are:

1. Fabric First – includes wall insulation, floor insulation, loft insulation and window upgrades
2. Basic Measures - removes the more difficult and more costly measures (wall and floor insulation) and focuses on the basic fabric measures (roof and windows)
3. Decarbonisation – includes Fabric First cost and costs of a heat pump or storage heaters and costs of Solar PV

There are also two sets of cost scenarios applied to each retrofit package. These are current costs and future costs. The current costs reflect costs likely to be faced by an individual attempting to decarbonise a property in the current market. The future costs include reductions in costs which may apply if the current market rates reduce, for example, labour costs, scaffolding, survey and planning costs through future efficiencies associated with economies of scale achieved through co-ordinated improvement programs.

Both sets of cost scenarios are included in the datasets provided with this report. For the purposes of reporting the future costs have been used below as these reflect economies of scale which are likely for Council led projects.

Fabric First Costs

In Harrogate 58,991 (75%), dwellings do not have one or more of the Fabric First measures. The retrofit cost model was applied to these dwellings for the outstanding retrofit measures.

Figure 10 provides a histogram showing the distribution of the Fabric First costs based on future costs for the 58,991 dwellings this was applied to.

Figure 10 shows the range and frequency of the Fabric First future costs in Harrogate. The costs range from the minimum of £1,719 up to £150,652 where all measures are required for dwellings within conservation areas.

Figure 10: Histogram of Fabric First retrofit costs based on future costs in Harrogate

Source: Sustenic Stock Profiles 2023

Using the cost model it is possible to look at different price points to understand the distribution of the cost of measures. Table 40 shows the number of dwellings by retrofit cost bands.

Table 40: Number, percentage and cost for dwellings in Harrogate requiring one or more of the Fabric First measure by banded retrofit costs

Fabric First Costs	Number of Dwellings	Per cent of Dwellings	Cost
Below £5,000	7,396	13%	£23 million
£5,000 to £10,000	16,742	28%	£132 million
£10,000 to £25,000	18,093	31%	£290 million
£25,000 to £50,000	11,800	20%	£429 million
Above £50,000	4,880	8%	£376 million
All Dwellings	**58,911**	**-**	**£1,250 million**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 40 shows that to retrofit dwellings in Harrogate requiring Fabric First measures would require funding levels of around £1,250 million.

For 24,138 (41%) of these dwellings, the cost of retrofit would be below £10,000 per dwelling. The cost to retrofit these dwellings would be around £155 million.

For 4,880 (8%) of these dwellings the cost of retrofit would be above £50,000 per dwelling. The cost to retrofit these dwellings would be around £376 million.

By splitting the dwellings requiring one or more of the four Fabric First measures by different characteristics it is possible to highlight the impact on retrofit costs for hard to decarbonise dwellings types. Table 41 shows the number of dwellings within banded retrofit costs for the Fabric First measures by wall type. Table 42 shows the number of dwellings within banded retrofit costs for the Fabric First measures by conservation area.

Table 41: Number and cost for dwellings in Harrogate requiring one or more of the Fabric First measure by banded retrofit costs and wall type

Fabric First Costs	Cavity Walls		Stone and Solid Walls		Other Wall Types	
	Number of Dwellings	Cost	Number of Dwellings	Cost	Number of Dwellings	Cost
Below £5,000	6,703	£21 million	307	£1 million	386	£1 million
£5,000 to £10,000	15,486	£123 million	298	£2 million	958	£7 million
£10,000 to £25,000	10,769	£154 million	6,072	£116 million	1,252	£20 million
£25,000 to £50,000	1,416	£44 million	9,704	£361 million	680	£23 million
Above £50,000	258	£16 million	4,531	£355 million	91	£6 million
All Dwellings	**34,632**	**£358 million**	**20,912**	**£835 million**	**3,367**	**£57 million**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 42: Number and cost for dwellings in Harrogate requiring one or more of the Fabric First measure by banded retrofit costs and conservation area

Fabric First Costs	Not in a Conservation Area		Within a Conservation Area	
	Number of Dwellings	Cost	Number of Dwellings	Cost
Below £5,000	6,063	£19 million	1,333	£4 million
£5,000 to £10,000	16,466	£130 million	276	£2 million
£10,000 to £25,000	15,171	£234 million	2,922	£56 million
£25,000 to £50,000	5,860	£207 million	5,940	£222 million
Above £50,000	732	£44 million	4,148	£332 million
All Dwellings	**44,292**	**£634 million**	**14,619**	**£616 million**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 41 shows that to retrofit the 20,912 solid and stone wall dwellings in Harrogate requiring Fabric First measures would require funding levels of around £835 million. This figure is higher than the £358 million funding needed for the 34,632 cavity wall dwellings.

Table 42 shows that to retrofit the 14,619 dwellings in conservation areas in Harrogate requiring Fabric First measures would require funding levels of around £616 million. This figure is only just below the £634 million funding needed for the 44,292 dwellings not in conservation areas in Harrogate.

Decarbonisation Costs

These costs go a step further than the fabric measures to add costs of upgrading to low carbon heating systems and installing solar PV[50].

In Harrogate it is unsurprising that 98% of dwellings (76,881) would require at least one of these decarbonisation measures.

Figure 11 provides a histogram of the Decarbonisation costs based on future costs.

Figure 11: Histogram of Decarbonisation costs based on future costs in Harrogate

Source: Sustenic Stock Profiles 2023

Figure 11 shows the range and frequency of the Decarbonisation future costs in Harrogate. The costs range from the minimum of £1,500 where only storage heaters are required up to £171,652 where all fabric first measures, a heat pump and PV are required for dwellings within conservation areas.

Table 43 shows the number of dwellings within retrofit cost bands for the Decarbonisation measures. It demonstrates that £2,343 million would be required to decarbonise the 76,881 dwellings where measures are required. This is an additional £1,093 million compared to only retrofitting the Fabric First measures.

For 35,210 (60%) of these dwellings, the cost to decarbonise would be below £25,000 per dwelling. The cost to retrofit these dwellings would be around £501 million.

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[50] It has been assumed that all dwellings with a roof will be able to have solar PV installed. Each dwelling would need to be assessed on a individual basis to ensure the structure of the roof is suitable for PV, as well as having the appropriate orientation and exposure to sunlight for PV to be effective.

For 10,719 (18%) of these dwellings the cost to decarbonise would be above £50,000 per dwelling. The cost to retrofit these dwellings would be around £794 million.

Table 43: Number and percentage of dwellings in Harrogate by cost scenario with cost distribution and total costs

Decarbonisation Costs	Number of Dwellings	Per cent of Dwellings	Cost
Below £5,000	4,163	7%	£11 million
£5,000 to £10,000	5,222	9%	£39 million
£10,000 to £25,000	25,825	44%	£451 million
£25,000 to £50,000	30,952	53%	£1,048 million
Above £50,000	10,719	18%	£794 million
All Dwellings	**76,881**	-	**£2,343 million**

Source: Sustenic Dwelling Level Stock Profiles 2023

Summary and Recommendations

The Sustenic Dwelling Level Stock Profiles results provided within this report, as well as the dataset[51] provided, have shown that the current energy efficiency levels in Harrogate are lower than for England. The average energy efficiency rating for dwellings in Harrogate is 63 compared to an average of 66 for England. Harrogate also has a higher proportion of dwellings with an EPC Band below Band C (63%) compared to England (54%).

The housing stock is, in many ways predisposed towards low levels of energy efficiency. 17% of the housing stock was built before 1900. The proportion of social dwellings in Harrogate (9%) is lower than the national average (17%). There are fewer flats (19%) than are found nationally (23%). All these are factors that are usually associated with lower levels of energy efficiency in housing.

These, and the more detailed results considering the individual retrofit measures required suggest that proportionally there is more retrofit improvement required in Harrogate to bring dwellings up to a minimum of an EPC Band C by 2030 than is found on average nationally. The high proportion of stock which are solid or stone built and needing external wall insulation, also suggests that the cost of retrofitting these dwellings will be higher than average. Furthermore, the low proportion of social dwellings in Harrogate suggests that proportionally fewer of these dwellings will be able to benefit from funding from the SHDF, meaning, a higher proportion of retrofit measures will need to be funded through HUG or the homeowner or private landlord. This is likely to place a greater burden on Council Officers seeking to address these challenges.

Action plan

The Sustenic Dwelling Level Stock Profiles within this report provide results down to dwelling level in order to provide a strategic overview to Harrogate, using open source data. These can be aggregated to Ward, Division and authority level to provide different lenses to this overview. From the report and the Sustenic Dwelling Level Stock Profiles on which it is based an action plan for retrofit needs across Harrogate can begin to be developed.

Retrofit costs

The retrofit costs provided in this report and accompanying dataset can help facilitate cost modelling scenarios to better inform bids for funding and future planning towards net zero. Retrofit costs estimates can be also be used in balancing an action plan addressing low cost and high retrofit cost dwellings. This is particularly useful where program costs are targeting an average figure (as with HUG).

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[51] The Sustenic Dwelling Level Stock Profiles were provided to Harrogate at dwelling level to allow the council to carry out further analysis as required.

Resourcing

The report has demonstrated the significant energy efficiency challenges present in the Harrogate housing stock. Addressing these will require significant effort and developing an action plan for retrofit would complement the existing intentions locally and regionally to retrofit domestic housing at scale.

Appendix 1 – Data Sources

Data sources used in development of the Sustenic Dwelling Level Stock Profiles are provide in Table A1.1

Table A1.1: Data sources used in development of the Sustenic Dwelling Level Stock Profiles For Harrogate

Dataset	Data level	Data of Data	Dataset source
EPC Data	Dwelling level	1st October 2008 – 30th September 2022	Energy Performance of Buildings Data England and Wales (opendatacommunities.org)
OS AddressBase Plus	Address Level	E98 January 2023 Update	Ordnance Survey
OS MasterMap Topography	Polygons	January 2023 Update Currency Update 08/12/2022	Ordnance Survey
OS MasterMap Building Heights	Polygons	October 2022	Ordnance Survey
Census Tenure	Census Output Areas level	2011	search - home - Nomis - Official Census and Labour Market Statistics (nomisweb.co.uk)
VOA Dwelling Age	Lower Super Output Area level	2015	Dwelling Ages and Prices	CDRC Data
Table 100 Tenure	Local Authority level	2021	Live tables on dwelling stock (including vacants) - GOV.UK (www.gov.uk)
ONS Sub regional tenure	Local Authority level	2020	Subnational estimates of dwellings by tenure, England - Office for National Statistics (ons.gov.uk)
Postcode look up	Postcode level	2021	Postcode to Output Area to Lower Layer Super Output Area to Middle Layer Super Output Area to Local Authority District (August 2021) Lookup in the UK	

			Open Geography Portal (statistics.gov.uk)
Off-gas postcodes	Postcode level	2017	off-gas-postcodes-v2.xlsx (live.com)
English Housing Survey, 2019: Housing Stock Data	Survey data anonymised at dwelling level	2019	UK Data Service
Listed buildings	Point data	January 2023	Download Listing Data - GIS Shapefiles | Historic England
Conservation areas	Polygon data	April 2022	Download Listing Data - GIS Shapefiles | Historic England
Parks and Gardens	Polygon data	January 2023	Download Listing Data - GIS Shapefiles | Historic England
Census Output Areas	Polygon data	2011	2011 Census Geography boundaries (Output Areas and Small Areas) | UK Data Service | Census Data
Wards	Polygon data	December 2021	Wards (December 2021) GB BFC (statistics.gov.uk)
North Yorkshire Council Divisions	Polygon data	From April 2023	Craven District Council
Local Authority	Polygon data	2020	Local Authority Districts (December 2019) Boundaries UK BGC - data.gov.uk

Appendix 2 – Retrofit Cost Model

Step 1 Decide on measures required

Deciding on the measures required will depend on whether a dwellings has firstly been identified as requiring any of the measures included. Once a measure has been identified, the type of insulation will depended on other characteristics of the dwelling. For example, if a dwelling requires wall insulation, the wall type will determine the type of insulation and therefore cost applied.

Step 2 Lookup cost measures required by build type and size

Dwelling sizes are based on floor areas. Typical floor areas are described in Table 16 of the UCL report[75] and to develop small and medium variants factors of 0.7 and 1.3 were applied. Details of those used for the retrofit cost model are in Table A2.1.

Table A2.1: Size of dwelling types by Total Floor Area (overall floors m2)

Factor applied to define small and large	0.7		1.3
	Small	Medium	Large
Cnv flat	46	65	85
Flat LR	39	55	72
Flat HR	39	55	72
Mid Terrace	57	81	105
End Terrace	60	86	112
Semi-Detached	65	93	121
Detached	106	152	198
Bungalow	54	77	100

Step 3 Apply heritage uplift percentage

The heritage uplifts are found in the Heritage Cost Uplifts worksheet of the EE spreadsheet. Table A2.2 is an extract from this worksheet. The uplifts applied to listed buildings has not been included.

Table A2.2: Size of dwelling types by Total Floor Area (overall floors m2)

Cost uplift per measure		Walls			Double glazing			Loft			Floor		
Heritage status		Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Conservation		30%	220%	500%	50%	80%	300%	5%	70%	110%	15%	170%	200%

Step 4 Apply local labour cost uplift

The local labour cost uplift is based on a number of assumptions including;

- Labour/contractors would not be sourced locally but would come from the nearest large cities of Leeds, Hull or Middlesborough by car or van and be paid a mileage rate of 45p per mile

- Labour/contractors would be paid for travel time in excess of normal time which we have assumed to be the national average (see summary of article on Randstad survey cited earlier in the report)78
- Contractors operate in four person teams as suggested by the PRP/Peabody report
- This would result in a 58% increase in local labour costs as detailed in Table A.6 below
- Labour costs account for 40% of current costs based and 50% of future (bid) costs. This assumption is based on Table A2.3, which is an extract from the PRP Peabody report.

Table A2.3: Labour uplift cost calculation

Travel time: arrive 08:00 depart 16:30	Leeds	Hull	M'borough
Local travel time (minutes)	154	130	150
Average national (minutes)	54	54	54
Excess local travel time (minutes)	100	76	96
Excess local travel time as a percentage of an 8 hour day	21%	16%	20%
Local travel distance	148	82	94
Local travel distance at 45p per mile	67	37	42
National travel time as a percentage of local travel time	35%	42%	36%
National travel distance at 45p per mile	23	15	15
Excess local over national	43	22	27
4 person team day rate from PRP/Peabody report	330	330	330
Plus 4 x travel excess	503	416	438
Plus paid travel time excess (minutes)	572	469	504
Per cent increase in labour costs	73%	42%	53%
Mid point between highest and lowest increase in labour costs		58%	

When multiplied together the labour uplift factors for the current cost model are;
- local labour cost uplift of 58% multiplied by 50% = 29%.

and for the future bid cost model;
- local labour cost uplift of 58% multiplied by 40% = 23%.

Table A2.4 show the final labour uplift factors used within the retrofit costs model

Table A2.4: Labour uplift cost calculation

	Current bid		Future (bid) approach	
PRP/Peabody report costs for pre-1919 mid terrace	Business as usual		Revised retrofit approach	
Labour costs	£8,366	50%	£7,253	40%
Total costs	£16,779		£18,333	
Labour uplift factors = local labour uplift factor (mid-point 58% *Labour %)		29%		23%

Step 5 Apply inflation uplift

To allow for inflation since the source costs were calculated an inflation factor calculated from the ONS Construction output price index[79] is applied by

1. dividing the current index value found in the Repair and Maintenance worksheet (112.8 for December 2021 the most recent data available at the time of writing) by the June 2019 value of 106.9 = 5.7% (at the time of writing) and
2. increasing the costs from step 3 by this percentage

Step 6 Economies of Scale

In the future (bid) cost model a 10% reduction was assumed although there is very little evidence to support any economies of scale. This is still however an important step in the process as these may be achieved in the future. If the cost model were further developed to cover specific cases (such as an area programme) potential for economies of scale would need to be further researched and this factor updated.

Step 7 Apply condition contingencies uplift

The PRP/Peabody report looked in some detail at the impact of conditions and while not making specific recommendations on a condition contingency factor they did in their Victorian dwelling case include a contingency of approximately 35% to cover potential condition problems. In the absence of any other definitive research we apply a 35% condition contingency. If an area program were planned this might be more accurately evaluated by a pre-program condition survey and before any installation measures by a detailed PAS2035 type survey.

Step 8 Add scaffolding costs

A base cost of £1,475 was established from the PRP/Peabody report. In practice a library of scaffolding costs would be expected to be built up from local contractors. A lower base cost of £986 was assumed for the future (bid) cost model based on assumptions that these would service EWI only. In both cases it is assumed these base costs would be reduced by 30% to take account of EWI only being permitted to the rear of the property.

Step 9 Add survey design and planning costs

A cost of £2,500 is added. This is at the high end of PRP/Peabody estimates. This is reduced to £1,352 for the future (bid) cost model based on assumptions of rolling programs allowing some economies of scale.

Step 10 Apply inflation uplift to (preliminary) overheads and add in

A similar approach is taken here to step 4 except the (preliminary) overhead (scaffolding, survey and design) estimates date from an earlier period so the current index is divided by the June 2016 index value. As previously the inflation factor is calculated from the ONS Construction output price index[80] and can be applied by

1. dividing the current index value found in the Repair and Maintenance worksheet (112.8 for December 2021 the most recent data available at the time of writing) by the June 2016 value of 100.5 = 10.7% and
2. increasing the costs from step 7 and 8 by this percentage and adding this in.

Step 11 Apply uplift for general overheads and profit

A 6.5% uplift is applied for general overheads and profit based on the PRP/Peabody report which quoted a national company applying such an uplift. Such estimates are difficult to come by and we apply it in the absence of any superior local or national knowledge.

Step 12 Apply future inflation uplift

An 8% uplift for inflation is applied based on the current inflation rate from the Bank of England. This is to reflect the likely price of any work being planned now. Ideally we would use the ONS Construction index but this is not due for update until mid-May 2022 and unlike the Bank of England does not include any forward projections.

Bank of England inflation for 2023 and 2024 of 5% and 2% respectively were used to produce estimates for the future (bid) cost model by compounding the interest rates.

Summary of differences between the current and future (bid) cost model

Steps 4 Uplift labour costs, 8, scaffolding, 9, survey and design and 12 future inflation are the only differences between the two models.