Title

North Yorkshire Council Summary Report: Sustenic Dwelling Level Stock Profiles with Low Carbon Heat Ready and Hard to Decarbonise indicators

Sustenic Local Government Services

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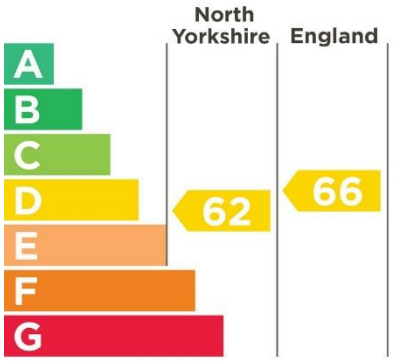
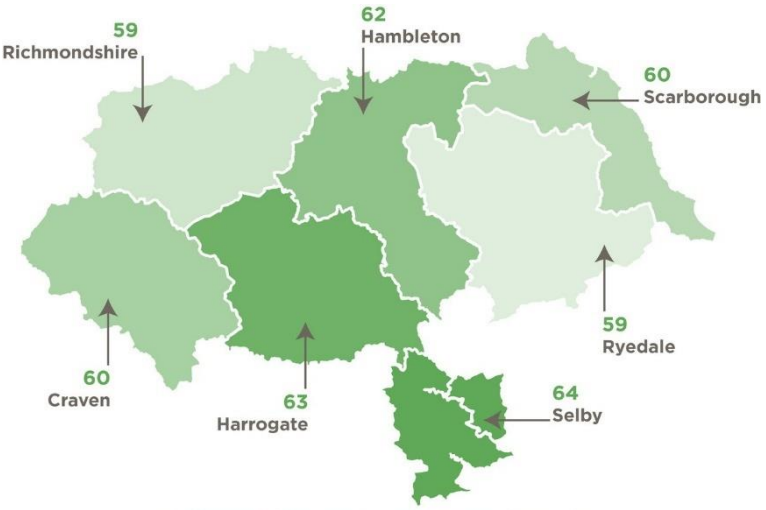
Headline Results – North Yorkshire

Average energy efficiency in North Yorkshire is lower than in England



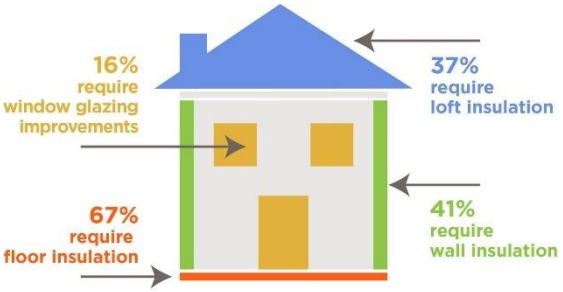


Richmondshire and Ryedale areas have the lowest levels of energy efficiency in North Yorkshire

Solid and stone walls are often harder and more expensive to retrofit than cavity wall dwellings

1 in 4 dwellings have all four of the main fabric energy efficiency measures

3 in 4 could benefit from fabric energy efficiency improvements



Dwellings in North Yorkshire could benefit from improvements to the main building fabric elements

Installing the main fabric measures, low carbon heating systems and renewables would require funding of around £9.5 billion in total

£5.1 Billion
to retrofit energy efficiency measures

£4.4 Billion
to install low carbon heating and renewables

£9.5 Billion
to decarbonise the housing stock

Executive summary

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 can support any future bid to support housing retrofit in North Yorkshire.

From April 2023, North Yorkshire Council will become a single council for everyone in North Yorkshire, replacing the county council and the seven district and borough councils[2]. These includes Craven, Hambleton, Richmondshire, Ryedale and Selby District Councils; and Harrogate and Scarborough Borough Councils.

This report brings together information from separate reports on each of the district and borough councils to provide a summary for the new North Yorkshire Council.

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 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[3].

Using the OS AddressBase dataset, 306,934 residential dwellings were identified across North Yorkshire.

The EPC data was merged with the OS AddressBase dataset using the UPRN (Unique Property Reference Number).

[1] Hitting Hard Action plan summary complete govt logo-1.pdf (ynylep.com)
[2] The new council and devolution for North Yorkshire | North Yorkshire County Council
[3] Energy Performance of Buildings Data England and Wales (opendatacommunities.org)

Once the distribution of all dwellings was established, small area data on dwelling characteristics were used to understand the types of dwellings, based on dwelling age and tenure which did not have EPC data. The stereotypes of these dwellings were 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 were retained, while adjusting for the bias in the EPC dataset.

Key results

Current Energy Efficiency

The average energy efficiency rating[4] for dwellings in North Yorkshire is 62, 4 points poorer than the average for England (66). 65% of dwellings (200,954) in North Yorkshire are below an EPC Band C, the bands at which the Home Upgrade Grant funding scheme is directed. 23,359 (8%) dwellings in North Yorkshire are in EPC Bands F and G, which are the least energy efficient. This is higher than the proportion of dwellings with an EPC Band F and G in England (3%).

The housing stock is, in many ways predisposed towards low levels of energy efficiency. 21% of the housing stock was built before 1900. The proportion of social dwellings in North Yorkshire (12%) is lower than the national average (17%). These are factors that are usually associated with levels of energy efficiency in housing.

Energy Efficiency Improvements

A detailed breakdown of energy efficiency improvements required across North Yorkshire to increase energy efficiency and make dwellings ready for a low carbon heating system reveal 37% (113,479) of lofts still require improved insulation and 16% (49,838) improved glazing. Wall insulation was more complex with 21% (42,498) of cavity walls still requiring insulation but the standout statistic is very clearly the 87% (80,536) of solid and stone walls that are uninsulated.

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

Hard to Decarbonise

The report also considers housing stock which is 'hard to decarbonise' as defined by the Climate Change Committee (CCC)[5]. 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 30% of the stock with solid or stone walls.

Heritage considerations are also identified as a potential barrier to decarbonisation with 8,466 dwellings in listed buildings where only the most limited of measures are likely to be permitted. In addition 63,536 (21%) 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.

In North Yorkshire 235,018 (77%), dwellings do not have one or more of the Fabric First[6] measures. The retrofit cost model was applied to these dwellings for the outstanding retrofit measures. To retrofit dwellings in North Yorkshire requiring Fabric First measures would require funding levels of around £5.1 billion.

These costs go a step further than the fabric measures to add costs of upgrading to low carbon heating systems and installing solar PV[7].

In North Yorkshire it is unsurprising that 98% of dwellings (301,273) would require at least one of these decarbonisation measures. It demonstrates that £9.5 billion would be required to decarbonise the 301,273 dwellings where measures are required. This is an additional £4.4 billion compared to only retrofitting the Fabric First measures.

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

[6] '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

[7] 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.

Conclusions and Recommendations

The Sustenic Dwelling Level Stock Profiles results provided within this report, indicate that the current energy efficiency levels in North Yorkshire are lower than for the average for England.

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

The 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 North Yorkshire 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.

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

From April 2023, North Yorkshire Council will become a single council for everyone in North Yorkshire, replacing the county council and the seven district and borough councils[10]. These included Craven, Hambleton, Richmondshire, Ryedale and Selby District Councils; and Harrogate and Scarborough Borough Councils.

This report brings together information from separate reports on each of the district and borough councils to provide a summary for new North Yorkshire Council.

The material in the report can 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 regional decision making.

[9] Hitting Hard Action plan summary complete govt logo-1.pdf (ynylep.com)
[10] The new council and devolution for North Yorkshire | North Yorkshire County Council

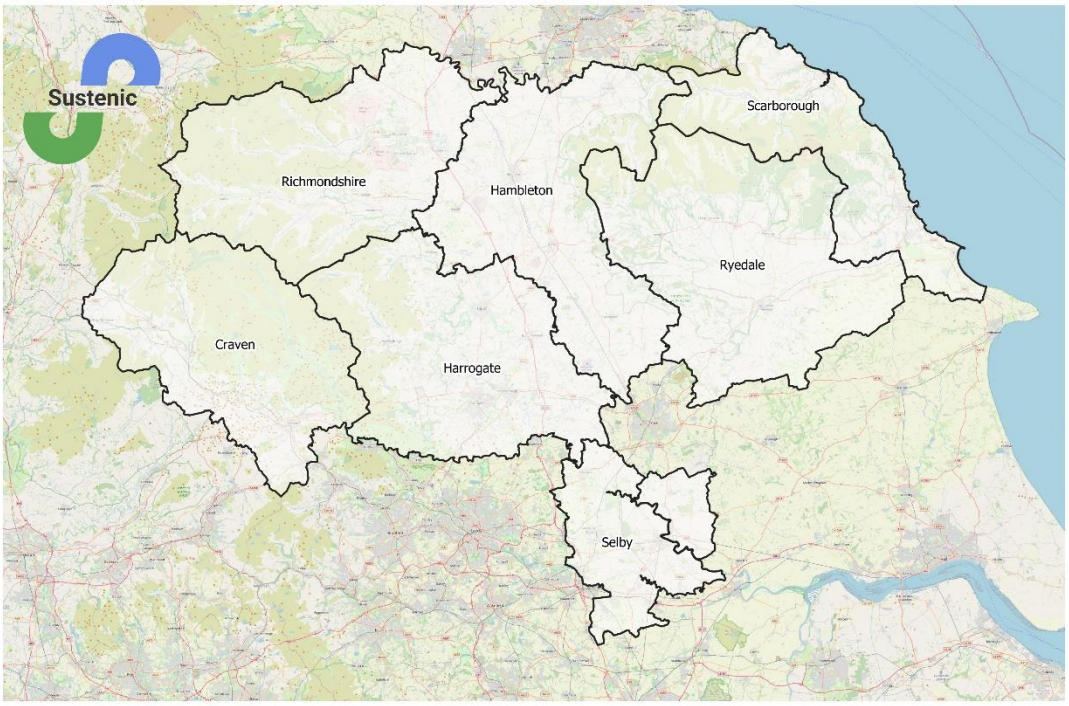
Background

North Yorkshire Council will be in the Government Office Region of Yorkshire and the Humber. The population in North Yorkshire is estimated at 615,400[11]. 74%[12] of the population are classed as living in Rural or Market towns compared to 26% of the population which are living in areas classed as urban.

For England only 27% population are classed as living in Rural or Market Towns which is considerably lower than North Yorkshire.

Map 1 shows the local authority boundaries which will merge to become North Yorkshire Council.

Map 1: North Yorkshire



[11] Population and household estimates, England and Wales: Census 2021 - Office for National Statistics (ons.gov.uk)
[12] Rural/urban local authority (LA) classification (England) - Office for National Statistics (ons.gov.uk)

Climate Change Strategy for North Yorkshire

The draft Climate Change Strategy for North Yorkshire 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. 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
- 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[13]. 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 North Yorkshire 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 understanding of required improvements to dwellings to move the housing stock towards net zero carbon targets.

Using the OS AddressBase dataset, 306,934 residential dwellings were identified across North Yorkshire.

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

The EPC data was merged with the OS AddressBase dataset using the UPRN (Unique Property Reference Number).

Once the distribution of all dwellings was established, small area data on dwelling characteristics were used to understand the types of dwellings, based on dwelling age and tenure which did not have EPC data. The stereotypes of these dwellings were 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 were retained, while adjusting for the bias in the EPC dataset.

The Sustenic Dwelling Level Stock Profiles results provided within this report will provide the new 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 North Yorkshire. This information will support and inform the climate change strategy and target of becoming net zero by 2034.

North Yorkshire Results

Current Energy Efficiency

The average energy efficiency rating[14] for dwellings in North Yorkshire is 62, 4 points poorer than the average for England (66).

Table 1 shows the distribution of current energy efficiency ratings of dwellings by EPC Band in North Yorkshire. In North Yorkshire there are 200,954 (65%) dwellings which are below an EPC Band C. Of these 23,359 (8%) have an EPC Band F or G.

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

EPC Band	Number of Dwellings	Per cent
Band A	950	0%
Band B	30,206	10%
Band C	74,824	24%
Band D	122,456	40%
Band E	55,139	18%
Band F	17,796	6%
Band G	5,563	2%
All Dwellings	**306,934**	-

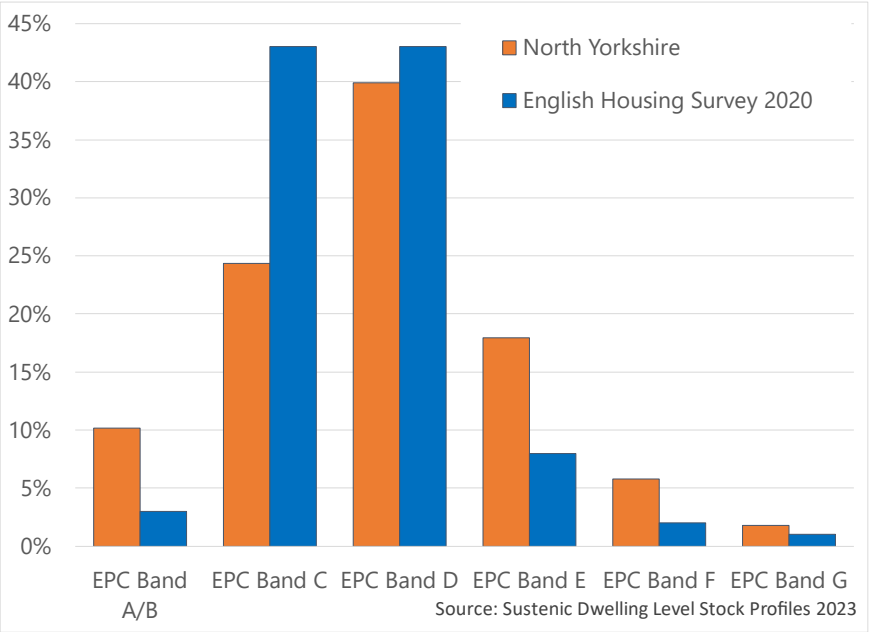
Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 1 shows the distribution of current energy efficiency ratings of dwellings by EPC band in North Yorkshire compared to England.

Compared to the distribution for England, North Yorkshire has a higher proportion of dwellings in the highest EPC Bands A and B, with 10% compared to the national figure of 3%. While this is positive, there is also a higher proportion of dwellings with low energy efficiencies in North Yorkshire. In North Yorkshire 18% of dwellings are in EPC Band E compared to 8% nationally, and 6% are in EPC Band F compared to 2% nationally.

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

Figure 1: Percentage of dwellings in each EPC Band in North Yorkshire compared to England



Energy Efficiency Improvements

To be able to meet the net zero targets set by Government, as well as the new council's targets, homes in the future will need 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. These systems are most effective when installed in dwellings where the building fabric is already energy efficient. For this reason 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

These are also the measures which could help improve the 200,954 (65%) dwellings in North Yorkshire which are below an EPC Band C.

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.

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.

Table 2 to Table 5 show the number and percentage of dwellings with each of the fabric first measures.

There are 193,455 (63%) dwellings in North Yorkshire with existing loft insulation of 200mm or more or where there is no loft. 113,479 (37%) would require additional loft insulation before the loft would meet the fabric first requirement.

Table 2: Fabric First Measure – Loft Insulation, in North Yorkshire

Loft Insulation	Number of Dwellings	Per cent
Loft LCHR (with 200mm+ of Insulation or No Loft)	193,455	63%
Loft Insulation required	113,479	37%
All Dwellings	**306,934**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

There are 257,096 (84%) dwellings in North Yorkshire with full double or triple glazing. 49,838 (16%) would require improvements to the windows before the windows would meet the fabric first requirement.

Table 3: Fabric First Measure – Window glazing, North Yorkshire

Windows	Number of Dwellings	Per cent
Windows LCHR (Full Double Glazing or Triple Glazing)	257,096	84%
Window improvement required	49,838	16%
All Dwellings	**306,934**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

There are 179,558 (59%) dwellings in North Yorkshire with full wall insulation. 127,376 (41%) would require wall insulation before the walls would meet the fabric first requirement.

Table 4: Fabric First Measure – Wall Insulation, in North Yorkshire

Walls	Number of Dwellings	Per cent
Walls LCHR (Fully insulated)	179,558	59%
Wall insulation required	127,376	41%
All Dwellings	**306,934**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

There are 100,232 (33%) dwellings in North Yorkshire with floor insulation or limited floor insulation. 206,702 (67%) would require floor insulation before the floors would meet the fabric first requirement.

Table 5: Fabric First Measure – Floor Insulation, in North Yorkshire

Floors	Number of Dwellings	Per cent
Floors LCHR (insulated, limited insulation or dwelling below)	100,232	33%
Floor insulation required	206,702	67%
All Dwellings	**306,934**	**-**

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.

Table ***6*** shows the number and percentage of dwellings which have all four fabric first measures. In North Yorkshire there are 71,916 (23%) dwellings which have all four of the fabric first measures. 235,018 (77%) dwellings are missing one or more of the fabric first measures.

Table 6: Fabric First Measure in North Yorkshire

Fabic First measures	Number of Dwellings	Per cent
Meets all Fabic First measures	71,916	23%
Missing one or more Fabric First measure	235,018	77%
All Dwellings	**306,934**	**-**

Source: Sustenic Dwelling Level Stock Profiles 2023

Area level summary

Table 7 provides a summary of the energy efficiency and energy efficiency improvements required in North Yorkshire at area level.

The areas with the lowest average energy efficiency are Richmondshire and Ryedale (both at 59, EPC Band D). Craven and Richmondshire have the highest proportion of dwelling below Band C (both 70%). Harrogate has the highest count of dwellings below Band C (49,104).

Scarborough has the highest proportion of dwellings requiring one or more of the Fabric First measures (83%). Harrogate has the highest count of dwellings requiring one or more of the Fabric First measures (58,911).

Table 7: Energy Efficiency retrofit measures required for dwelling below EPC Band C by area in North Yorkshire

	Number of Dwellings	Av. Energy Efficiency Rating	Per cent of Dwellings below Band C	Number of Dwellings below Band C	Per cent with One or more Fabric First measures required	Number with One or more Fabric First measures required	Loft Insulation required	Window improvement required	Wall insulation required	Floor insulation required
Craven	29,663	60	70%	20,778	79%	23,328	12,761	4,768	15,841	21,013
Hambleton	44,397	62	64%	28,563	74%	32,987	13,689	5,651	15,467	30,732
Harrogate	78,295	63	63%	49,104	75%	58,911	28,550	12,228	32,666	50,409
Richmondshire	24,202	59	70%	16,996	79%	19,089	8,212	4,330	10,353	17,304
Ryedale	28,448	59	69%	19,639	75%	21,420	9,817	6,279	11,788	19,762
Scarborough	59,502	60	69%	40,911	83%	49,561	25,564	13,480	29,253	40,320
Selby	42,427	64	59%	24,963	70%	29,722	14,886	3,102	12,008	27,162

Source: Sustenic Dwelling Level Stock Profiles 2023

York & North Yorkshire's Routemap to Carbon Negative Targets

The energy efficiency data can be used to help plan retrofit projects across North Yorkshire. Each of the individual report provided to Craven, Hambleton, Harrogate, Richmondshire, Ryedale, Scarborough and Selby contain detailed maps of where dwellings below Band C are located as well as where the retrofit measures are required. Datasets containing the dwelling level information were also provided.

Target: Retrofit homes to at least an EPC C rating - 180,000 by 2030 and 250,000 by 2038

Within North Yorkshire 200,954 dwellings are currently below Band C. At least 49,046 dwellings below Band C would need to be retrofitted within York to meet the target to retrofit 250,000 by 2038

At 1 April 2023 to retrofit 180,000 dwellings across York and North Yorkshire by 2030 will require 23,207 dwellings to be improved per year which is 64 dwellings per day.

At 1 April 2023 to retrofit 250,000 dwellings across York and North Yorkshire by 2038 will require 15,861 dwellings to be improved per year which is 43 dwellings per day.

Target: Large-scale deployment of heat pumps – 130,000-200,000 will be required by 2030, and 200,000-270,000 by 2038

Within North Yorkshire 71,916 dwellings currently have all four Fabric First measures and are therefore potentially Low Carbon Heat Ready. To achieve the target to deploy heat pumps to 130,000 - 200,000 dwellings by 2023, between 58,084 - 128,084 would need to be retrofitted before being suitable for a heat pump to be effective.

At 1 April 2023 to retrofit between 130,000 – 200,0000 dwellings across York and North Yorkshire by 2030 will require between 16,761 and 25,786 dwellings to be improved per year which is between 46 and 71 dwellings per day.

At 1 April 2023 to retrofit 200,000 – 270,000 dwellings across York and North Yorkshire by 2038 will require between 12,689 and 17,130 dwellings to be improved per year which is between 35 and 47 dwellings per day.

Hard to Decarbonise

The Hitting Hard project for Richmondshire and Scarborough provided research on approaches to low carbon heating transition options for hard to decarbonise homes and prepared an action plan for Richmondshire and Scarborough to aid the decarbonisation of these homes[15].

The Climate Change Committee has described hard to decarbonise dwellings as, "Homes for which the decarbonisation costs will be higher, the barriers harder to overcome, or the solutions more complex."

As part of the Hitting Hard project, Scarborough highlighted Victorian terraces as requiring particular attention regarding barriers to retrofit and Richmondshire identified stone built properties as requiring particular attention regarding barriers to retrofit.

Figure 2 shows an example of Victorian terraces and Figure 3 shows an example of an older stone wall dwelling.

Figure 2: Example of Victorian terraces

Figure 3: Example of older stone wall dwelling

These two dwelling types are found throughout North Yorkshire and will pose similar challenges to those discussed within the Hitting Hard report. The learnings from the detailed case studies and retrofit plans for these dwelling types within the Hitting Hard report will therefore be transferable to similar solid wall and stone wall dwellings across North Yorkshire.

[15] Hitting Hard Action plan summary complete govt logo-1.pdf (ynylep.com)

Physical Attributes

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

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 8 shows the number and percentage of dwellings in each dwelling age band (detailed breakdown) in North Yorkshire. Figure 4 shows the percentage of dwellings grouped by dwelling age in North Yorkshire.

In North Yorkshire, 63,136 (21%) dwellings were built before 1900, with a further 58,313 (19%) 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[16]. North Yorkshire has 103,294 (34%) dwellings which were built between 1950 and 1990 and will be predominantly cavity wall and offer greater opportunities for improvements in cavity wall insulation.

North Yorkshire has 82,191 (26%) more modern dwellings, 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.

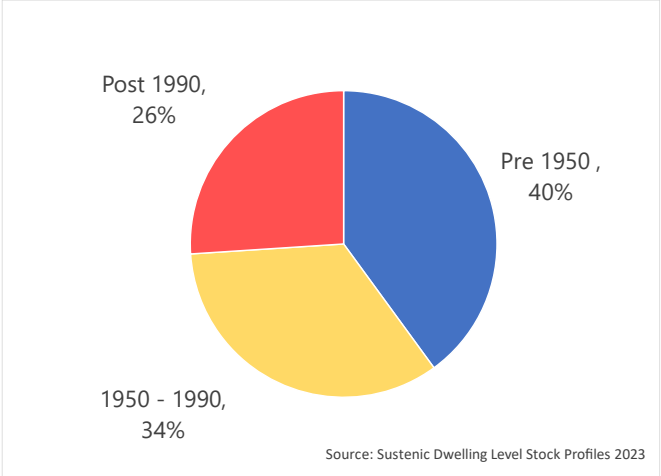
[16] Cavity wall construction became prevalent in some areas of the country, notably coastal areas, as early as the 1870s but outside of these areas was mainly introduced during the 1930s suburban building boom.

Table 8: Number and percentage of dwellings in North Yorkshire by dwelling age

Dwelling Age	Number of Dwellings	Per cent
Pre 1900	63,136	21%
1900 - 1929	25,386	8%
1930 - 1949	32,927	11%
1950 - 1966	29,681	10%
1967 - 1975	27,113	9%
1976 - 1982	23,983	8%
1983 - 1990	22,517	7%
1991 - 1995	7,876	2%
1996 - 2002	22,236	7%
2003 - 2006	9,619	3%
2007 onwards	42,460	14%
All Dwellings	**306,934**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

Figure 4: Percentage of dwellings by grouped dwelling age in North Yorkshire



Source: Sustenic Dwelling Level Stock Profiles 2023

Wall Type

Table 9 shows the number and percentage of dwellings by wall type. 203,480 (67%) dwellings have cavity walls. 43,082 (14%) dwellings have solid walls. 49,669 (16%) dwellings have stone walls. The other 10,703 (3%) dwellings are system built[17], timber frame, park homes or cob constructed[18] dwellings.

Table 9: Number and percentage of dwellings by wall type in North Yorkshire

Wall Types	Number of Dwellings	Per cent
Cavity Walls	203,480	67%
Solid Walls	43,082	14%
Stone Walls	49,669	16%
Timber	6,771	2%
System Built	3,687	1%
Park Homes	209	0%
Cob	36	0%
All Dwellings	**306,934**	-

Source: Sustenic Dwelling Level Stock Profiles 2023

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

Table 10 shows the number and percentage of dwellings by wall type and insulation. 179,569 (59%) dwellings have wall insulation. Of the 127,365 (41%) dwellings which are uninsulated or only partially insulated, 42,496 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.

38,512 of the uninsulated or only partially insulated dwellings are solid walls and 42,024 are stone 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. 1,824 are timber frame and 2,273 are system built, however, more data would be required to determine if any of these are light weight timber frame or prefab concrete cavity (which are considered hard to treat).

Table 10: Number and percentage of dwellings by wall type and insulation in North Yorkshire

Wall Types	Insulated	Per cent	Uninsulated or partially insulation	Per cent
Cavity Walls	160,984	79%	42,496	21%
Solid Walls	4,570	11%	38,512	89%
Stone Walls	7,645	15%	42,024	85%
Timber	4,947	73%	1,824	27%
System Built	1,414	38%	2,273	62%
Park Homes	5	2%	204	98%
Cob	4	11%	32	89%
All Dwellings	**179,569**	**59%**	**127,365**	**41%**

Source: Sustenic Dwelling Level Stock Profiles 2023

Dwellings directly fronting onto roads and paths

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 (Figure 5), where the side face of a dwelling is directly adjacent to a footpath (Figure 6), where there is a passageway between dwellings (Figure 7).

Spatial analysis has been carried out using OS MasterMap to identify dwellings which have external walls next to roads or paths. In North Yorkshire this analysis identified 53,716 (18%) dwellings with this feature.

Figure 5: Example of dwellings with front face fronting onto a footpath

©2022 Google, Image capture: July 2018

Figure 6: Example of dwellings with side face directly adjacent to a footpath

©2022 Google, Image capture: Oct 2014

Figure 7: Example of dwellings with side face directly adjacent to a passageway

©2022 Google, Image capture: July 2018

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[19] 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 North Yorkshire there are a total of 10,825[20] 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).

[19] 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.
[20] Download Listing Data - GIS Shapefiles | Historic England

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 North Yorkshire. Table 11 shows the results of this analysis and a breakdown of the grading for these dwellings[21]. From this analysis 8,466 dwellings were identified as being listed, with 8,143 being grade II listed and 289 being grade II* listed.

Table 11: Number of Listed buildings and dwellings by grading in North Yorkshire

Listed Buildings		North Yorkshire
Number of listings		10,825
Number of listing (domestic)		5,688
Number of listed dwellings		8,466
Grade of listed dwelling	I	34
	II	8,143
	II*	289
	Total	8,466

Source: Sustenic Dwelling Level Stock Profiles 2023

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.

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.

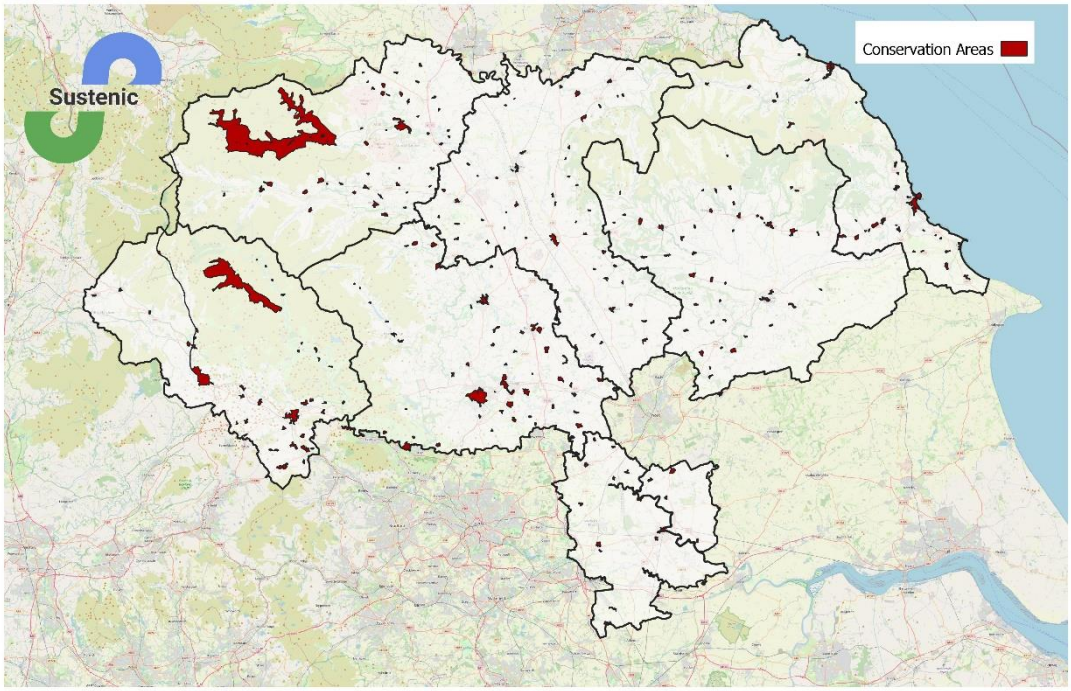
There are 63,536 (21%) dwellings within the conservation areas across North Yorkshire

[21] 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.

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 2 shows the conservation areas within North Yorkshire.

Map 2: Conservation areas in North Yorkshire



A large proportion of North Yorkshire is within the North York Moors and the Yorkshire Dales National Parks. National parks are run by National Park Authorities for the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage[22].

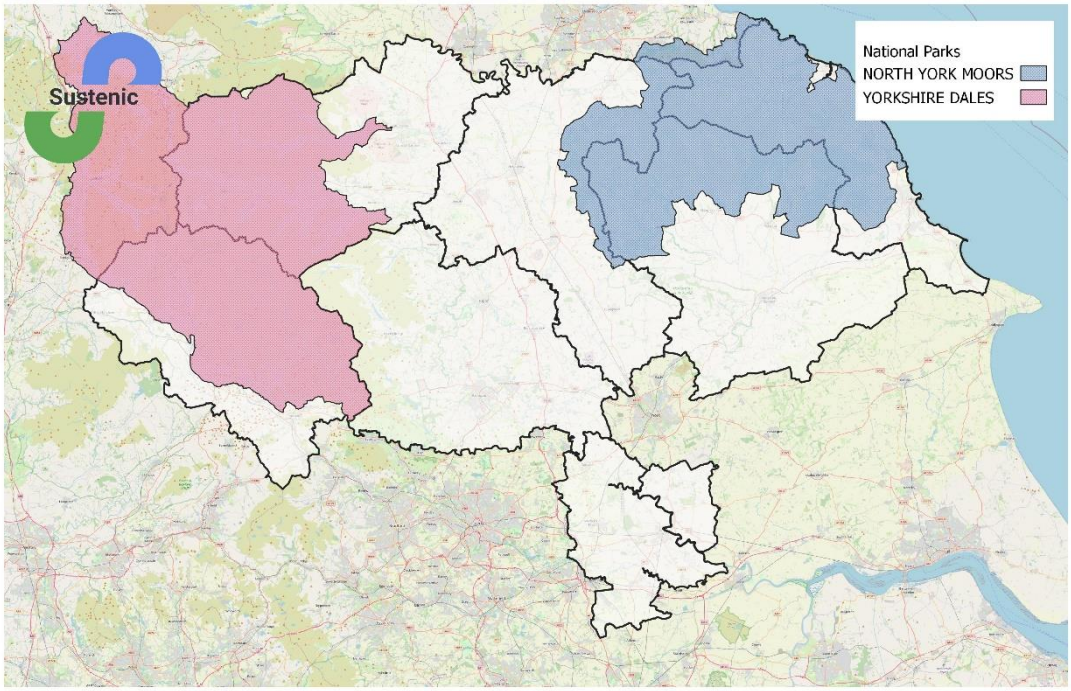
Dwellings within these areas may be subject to additional or different planning constraints.

Map ***3*** shows North Yorkshire overlaid with the boundaries of the North York Moors and the Yorkshire Dales National Park.

Due to the national park crossing the council borders it is not just the council who are responsible for the conservation areas within their areas. The technical definition of a conservation area is an area of special architectural or historic interest, the character or appearance of which it is desirable to preserve or enhance'. They may be declared in any location which exhibits a particular character that the planning authority wants to preserve.

[22] National Parks (England) - data.gov.uk

Map 3: Overlap of North York Moors and Yorkshire Dales National Park with North Yorkshire



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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 covered this should fill this gap in the data.

Tenure

In North Yorkshire 215,427 (70%) dwellings are owner occupied, 55,969 (18%) are privately rented and 35,537 (12%) are social housing.

Compared to the tenure distribution in England, the proportion of privately rented dwellings in North Yorkshire at 18% is the same proportion as England. North Yorkshire has a higher proportion of owner occupied dwellings, 70% compared to 65% in England. The proportion of social rented dwellings is lower in North Yorkshire, 12% 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 North Yorkshire compared to nationally, improving energy efficiency in North Yorkshire will require targeted initiatives to incentivize homeowners to upgrade their properties.

Household Income

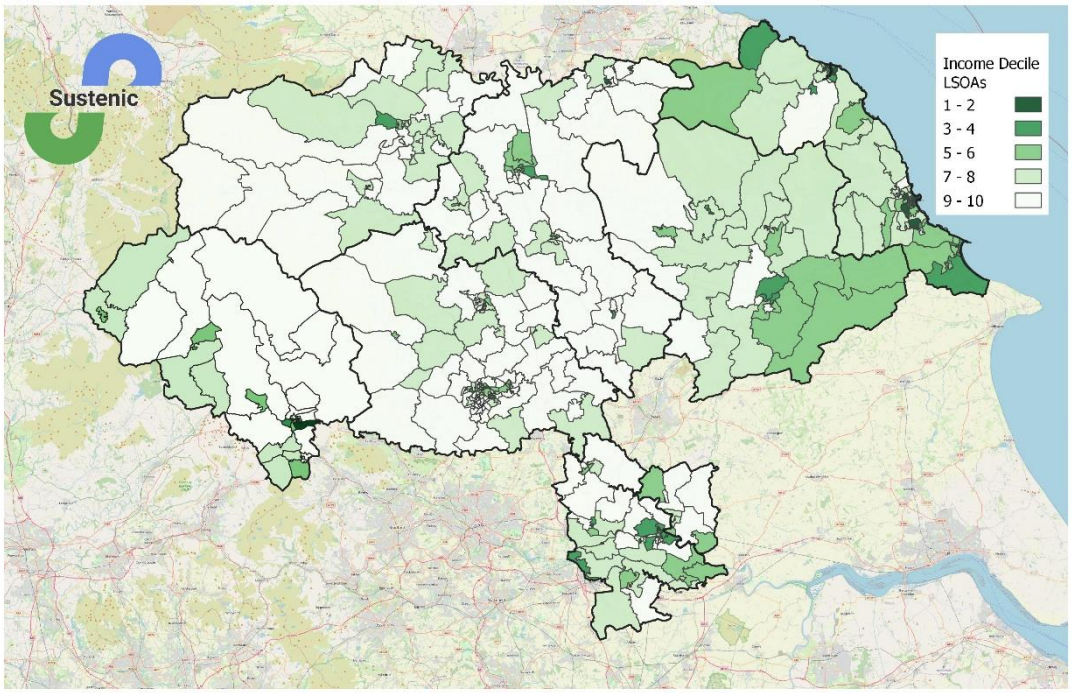
For a number of the funding streams available for energy efficiency improvements, funding is dependent on a household's income, designed to help those on low incomes improve their homes. The Indices of Deprivation[23] includes an income score, down to Lower Super Output Area (LSOA) which is also provided by deciles for England.

Map 4 shows the income decile for England at LSOA for North Yorkshire.

Of the 323 LSOAs in North Yorkshire, 22 are within the lowest 20% for England based on the income score. 16 of these are in Scarborough.

[23] English indices of deprivation - GOV.UK (www.gov.uk)

Map 4: Low Income Decile at LSOA level in North Yorkshire



Source: English indices of deprivation 2019
Contains OS data © Crown copyright and database right 2017
© OpenStreetMap contributors

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. 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 North Yorkshire 235,018 (77%), 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.

Using the cost model it is possible to look at different price points to understand the distribution of the cost of measures. Table 12 shows the number of dwellings by retrofit cost bands.

Table 12: Number, percentage and cost for dwellings in North Yorkshire 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	28,500	12%	£91 million
£5,000 to £10,000	63,471	27%	£500 million
£10,000 to £25,000	75,063	32%	£1.2 billion
£25,000 to £50,000	46,744	20%	£1.7 billion
Above £50,000	21,240	9%	£1.6 billion
All Dwellings	**235,018**	**-**	**£5.1 billion**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 12 shows that to retrofit dwellings in North Yorkshire requiring Fabric First measures would require funding levels of around £5.1 billion.

For 91,971 (29%) of these dwellings, the cost of retrofit would be below £10,000 per dwelling. The cost to retrofit these dwellings would be around £591 million.

For 21,240 (9%) of these dwellings the cost of retrofit would be above £50,000 per dwelling. The cost to retrofit these dwellings would be around £1.6 billion.

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 13 shows the number of dwellings within banded retrofit costs for the

Fabric First measures by wall type. Table 14 shows the number of dwellings within banded retrofit costs for the Fabric First measures by conservation area.

Table 13: Number and cost for dwellings in North Yorkshire 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	26,510	£85 million	1,079	£3 million	911	£3 million
£5,000 to £10,000	60,332	£476 million	1,263	£10 million	1,876	£14 million
£10,000 to £25,000	46,420	£649 million	25,149	£476 million	3,494	£58 million
£25,000 to £50,000	5,686	£177 million	39,049	£1.4 billion	2,009	£67 million
Above £50,000	694	£43 million	20,323	£1.6 billion	223	£15 million
All Dwellings	**139,642**	**£1.4 billion**	**86,863**	**£3.5 billion**	**8,513**	**£157 million**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 14: Number and cost for dwellings in North Yorkshire 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	25,139	£80 million	3,361	£11 million
£5,000 to £10,000	62,578	£494 million	893	£7 million
£10,000 to £25,000	65,786	£1.1 billion	9,277	£172 million
£25,000 to £50,000	27,133	£957 million	19,611	£731 million
Above £50,000	3,509	£211 million	17,731	£1.4 billion
All Dwellings	**184,145**	**£2.8 billion**	**50,873**	**£2.3 billon**

Source: Sustenic Dwelling Level Stock Profiles 2023

Table 13 shows that to retrofit the 86,863 solid and stone wall dwellings in North Yorkshire requiring Fabric First measures would require funding levels of around £3.5 billion. This figure is higher than the £1.4 billion funding needed for the 139,642 cavity wall dwellings.

Table 14 shows that to retrofit the 50,873 dwellings in conservation areas in North Yorkshire requiring Fabric First measures would require funding levels of around £2.3 billion. This figure is only just below the £2.8 billion funding needed for the 184,145 dwellings not in conservation area in North Yorkshire.

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[24].

In North Yorkshire it is unsurprising that 98% of dwellings (301,273) would require at least one of these decarbonisation measures.

Table 15 shows the number of dwellings within retrofit cost bands for the Decarbonisation measures. It demonstrates that £9.5 billion would be required to decarbonise the 301,273 dwellings where measures are required. This is an additional £4.4 billion compared to only retrofitting the Fabric First measures.

For 133,100 (44%) of these dwellings, the cost to decarbonise would be below £25,000 per dwelling. The cost to retrofit these dwellings would be around £2 billion.

For 46,855 (16%) of these dwellings the cost to decarbonise would be above £50,000 per dwelling. The cost to retrofit these dwellings would be around £3.5 billion.

Table 15: Number and percentage of dwellings in North Yorkshire by cost scenario with cost distribution and total costs

Decarbonisation Costs	Number of Dwellings	Per cent of Dwellings	Cost
Below £5,000	11,531	4%	£28 million
£5,000 to £10,000	21,061	7%	£155 million
£10,000 to £25,000	100,508	33%	£1.8 billion
£25,000 to £50,000	121,318	40%	£4.1 billion
Above £50,000	46,855	16%	£3.5 billion
All Dwellings	**301,273**	**-**	**£9.5 billion**

Source: Sustenic Dwelling Level Stock Profiles 2023

[24] 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.

Summary and Recommendations

The Sustenic Dwelling Level Stock Profiles results provided within this report have shown that the current energy efficiency levels in North Yorkshire are lower than for England. The average energy efficiency rating for dwellings in North Yorkshire is 62 compared to an average of 66 for England. North Yorkshire also has a higher proportion of dwellings with an EPC Band below Band C (65%) compared to England (54%).

The housing stock is, in many ways predisposed towards low levels of energy efficiency. 21% of the housing stock was built before 1900. The proportion of social dwellings in North Yorkshire (12%) is lower than the national average (17%). These are factors that are usually associated with 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 North Yorkshire 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 North Yorkshire suggests that proportionally fewer of these dwellings will be able to benefit from funding from the Social Housing Decarbonisation Fund, meaning a higher proportion of retrofit measures will need to be funded through the Home Upgrade Grant (HUG), 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 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 North Yorkshire 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)).

Resourcing

The report has demonstrated the significant energy efficiency challenges present in the North Yorkshire 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 North Yorkshire

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
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)
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

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.