

BRE Client Report

BRE Integrated Dwelling Level Housing Stock Modelling and Database for Preston City Council

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Executive summary

- Preston City Council commissioned BRE to undertake a series of modelling exercises on their housing stock which required BRE to produce an integrated stock model which includes tenure data provided by Preston City Council. The BRE models also integrate Energy Performance Certificate (EPC)¹ data. As a result of this, 30,264 addresses have had their imputed energy characteristics replaced with observed characteristics from the EPC data for the purposes of the energy model. The use of this observed data will lead to more accurate energy models for these cases, which account for 49.1% of the total stock in Preston.
- This report describes the work and the results obtained from the integrated model and Housing Stock Condition Database (HSCD). Access to the HSCD is also provided to the council to enable them to obtain specific information whenever required.
- The detailed housing stock information provided in this report will facilitate the delivery of Preston City Council's housing strategy and enable a targeted intervention approach to improving housing. In addition to this there are also several relevant government policies – the Housing Act 2004, Housing Strategy Policy, Local Authority Housing Statistics (LAHS) and the Energy Companies Obligation (ECO).
- The main aims of this work were to provide estimates of:
 - The percentage of dwellings with the presence of each of the Housing Standards Variables² for Preston overall and broken down by tenure and then mapped by Census Output Area (COA) (private sector stock only)
 - Information relating to LAHS reporting for the private sector stock - category 1 hazards and Houses in Multiple Occupation (HMOs) as well as information on EPC ratings
- BRE Housing Stock Models were used to provide such estimates at dwelling level and focussing on private sector housing. The Housing Standards Variables provide Preston with detailed information on the likely condition of the stock and the geographical distribution of properties of interest.
- A stock modelling approach has been developed and used by BRE for many years and the most recent 2018 models have been updated to make use of the results of the 2015 English Housing Survey (EHS)³. The models also make use of Experian and Ordnance Survey (OS) data. OS AddressBase Plus is used as a basis for the list of all dwellings in the authority, and applying

¹ EPCs are an indication of how energy efficient a building is - with a rating from A (very efficient) to G (inefficient). They are required whenever a property is built, sold or rented.

² Presence of a HHSRS category 1 hazard, presence of a category 1 hazard for excess cold, presence of a category 1 hazard for falls, dwellings in disrepair, fuel poverty (10% and Low Income High Cost definitions), dwelling occupied by a low income household and SimpleSAP rating.

³ 2015 is the latest available data. Prior to the 2018 models EHS 2014 data was used.



improved geo-modelling⁴ is used to determine the dwelling type and floor area from OS Mastermap. The energy model that lies at the heart of the modelling process are based on the 2012 version of SAP, and the methods for imputing the inputs to this model incorporate information sources from additional sources. These include the age of postcodes (to improve dwelling age data) and data from Xoserve to determine whether the dwelling is on the gas network. These dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the Housing Standards Variables. These outputs can then be mapped to provide the authority with a geographical distribution of each of the variables which can then be used to target resources for improving the housing stock.

- Furthermore, Preston City Council provided an additional source of “local data” – tenure data. Energy Performance Certificate (EPC) data is also integrated by BRE. These data sets were then incorporated into the BRE Housing Stock Model to produce an integrated Housing Stock Condition Database (HSCD).
- The headline results are provided on the following page:

⁴ The OS data has been used to update a number of the model inputs – the main value of the OS data is the ability to determine the dwelling type with much greater confidence – see **Appendix B** for more information.



Headline results for Preston

There are 61,625 dwellings in Preston, 56% are owner occupied, 25% private rented and 19% social rented.

7,793 dwellings in the private sector have category 1 Housing Health and Safety Rating System (HHSRS) hazards. This equates to 16% of properties. *See full results*

2,512 dwellings in the private rented sector have category 1 HHSRS hazards. This equates to 16% of properties in the private rented sector. *See full results*

The highest concentrations of all HHSRS hazards in the private sector are found in the wards of Preston Rural North, Deepdale and Fishwick & Frenchwood. *See full results*

The highest concentrations of fuel poverty (Low Income High Costs (LIHC) definition) in the private sector are found in the wards of Ribbleton, Preston Rural North and City Centre and for excess cold the highest concentrations are in Preston Rural North, Preston Rural East and St Matthew's. *See full results*

The average SimpleSAP rating for all private sector dwellings in Preston is 61, which is better than England (60) but the same as North West. For owner occupied stock the figure is 60 and for private rented stock it is 61. *See full results*

Maps by Census Output Area (COA) have been provided for the above Housing Standards Variables. *See maps*

The total cost of mitigating category 1 hazards in Preston's private sector stock is estimated to be £17.6 million – with £11.9 million in the owner occupied sector, and £5.7 million in the private rented sector. *See full results*

There are an estimated 3,471 HMOs in Preston, of which approximately 657 come under the mandatory licensing scheme. *See full results*

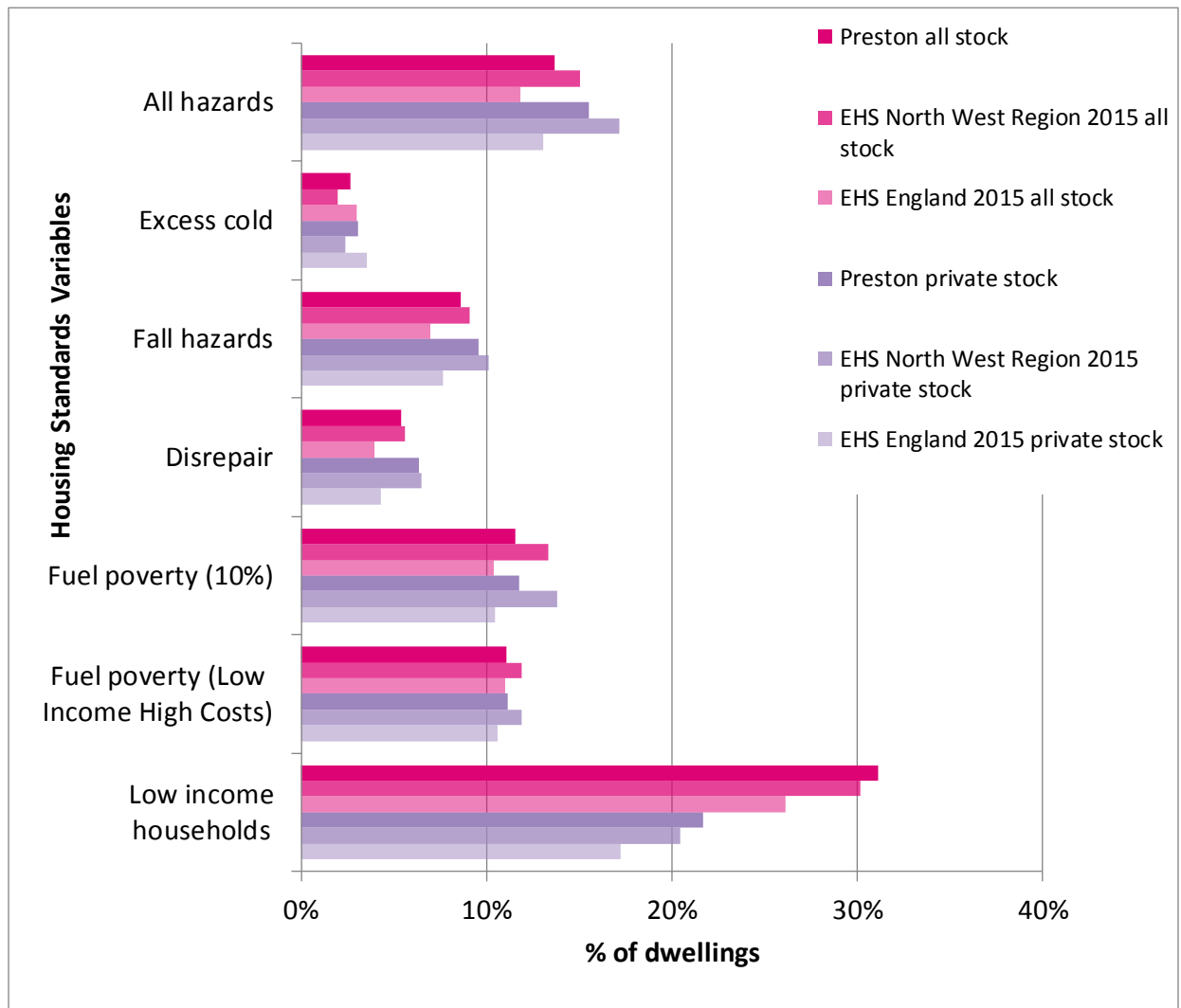
4.6% (2,327) of private sector dwellings and 4.5% (694) of private rented dwellings in Preston are estimated to have an EPC rating below band E. *See full results*



Key illustrations of headline results

- The table below shows the results for 7 of the Housing Standards Variables in Preston compared to regional data and England (EHS 2015) - split into all stock and private sector stock. The data shows that the performance of the housing stock in Preston compared to the EHS England average is generally worse, with the exception of excess cold and fuel poverty (LIHC definition) where Preston has similar levels. Compared to the regional average the picture is different with Preston performing slightly worse for excess cold and low income households and slightly better for the other variables.

Estimates of the percentage of dwellings with the presence of each of the Housing Standards Variables criteria assessed by the housing stock models and HSCD for all stock and private sector stock – Preston compared to the North West and England (EHS 2015)





- The table below shows the number and percentage of Preston’s private rented stock falling into each of the EPC ratings bands (based on SimpleSAP). The number of private rented dwellings in Preston with a rating below band E (i.e. bands F and G), is estimated to be 694 (4.5%). Compared to England, there are a greater proportion of dwellings in band C and D and lower proportions in bands E to G.

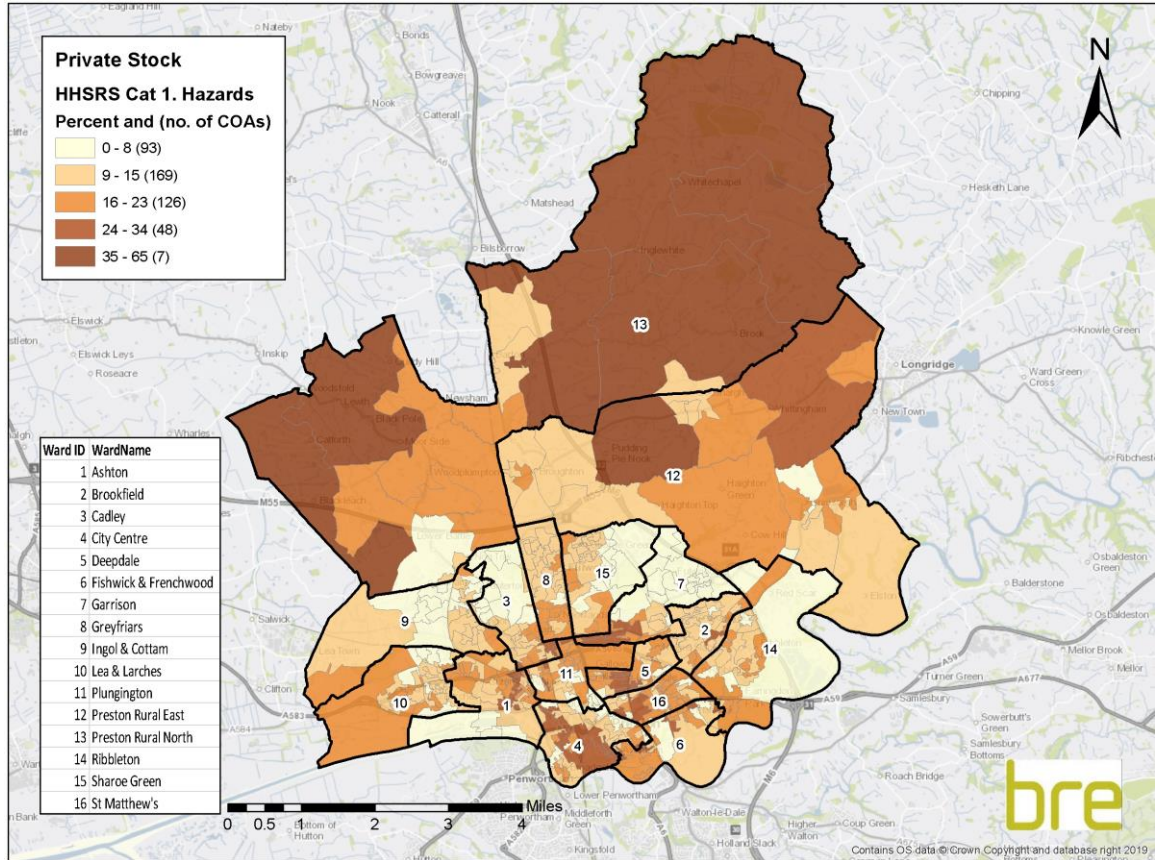
Number and percentage of Preston’s private rented stock falling into each of the EPC ratings bands (based on SimpleSAP)

	Preston		2015 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	1.2%
(81-91) B	98	0.6%	
(69-80) C	4,205	27.4%	25.3%
(55-68) D	7,640	49.8%	49.1%
(39-54) E	2,708	17.6%	18.1%
(21-38) F	542	3.5%	4.5%
(1-20) G	152	1.0%	1.8%

- The map overleaf shows the distribution of category 1 hazards, as defined by the Housing Health and Safety Rating System (HHSRS). The highest concentrations are mainly in southern and some northern parts of the Preston area, the data behind the map shows that the highest levels overall are in the wards of Preston Rural North, Deepdale and Fishwick & Frenchwood, with City Centre, Ashton and St. Matthew’s wards also having high levels.



Percentage of private sector dwellings in Preston with the presence of a HHSRS category 1 hazard





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1 Introduction

Preston City Council commissioned BRE to undertake a series of modelling exercises on their housing stock. BRE have integrated data provided by the authority into the models to produce an integrated database and corresponding report. This report describes the modelling work and provides details of the results obtained from the integrated dwelling level model and database.

The BRE Model also integrates Energy Performance Certificate (EPC) data and, as a result of this, 30,264 addresses have had their imputed energy characteristics replaced with observed characteristics from the EPC data for the purposes of the energy model. The use of this observed data will lead to more accurate energy models for these cases, which account for 49.1% of the total housing stock in Preston.

The BRE Housing Stock data is provided to the council via the online Housing Stock Condition Database (HSCD) to enable them to obtain specific information whenever required.

The BRE Housing Stock Models provide the council with dwelling level information on various Housing Standards Variables, focussing on private sector housing. These variables provide Preston City Council with detailed information on the likely condition of the stock and the geographical distribution of properties of interest. These properties are likely to be suitable targets for energy efficiency improvements or other forms of intervention, such as mitigating Housing Health and Safety Rating System (HHSRS) hazards. The variables are split into categories related to house condition, energy efficiency and household vulnerability as shown in **Table 1** (see **Appendix A** for full definitions).

Table 1: Housing Standards Variables split into categories

Housing Standards Variable	House condition variables	Energy efficiency variables	Household vulnerability variables
Presence of HHSRS cat 1 hazard	✓		
Presence of cat 1 hazard for excess cold	✓	✓	
Presence of cat 1 hazard for falls	✓		
Dwellings in disrepair	✓		
Fuel Poverty (10% & Low income, High cost definitions)			✓
Dwellings occupied by low income households			✓
SimpleSAP rating		✓	

N.B. Presence of category 1 hazard for falls does NOT include the hazard of falling between levels

The single variables shown in **Table 1** can also be brought together within the HSCD to provide powerful information on the housing stock; for example, dwellings suffering from excess cold and also occupied by households on a low income. This enables council officers to explore the stock and to assess the likely scope of any programmes they might wish to implement.



The information in this report includes estimates relating to the Ministry of Housing, Communities and Local Government's (MHCLG) Local Authority Housing Statistics (LAHS) reporting of costs of mitigating hazards, numbers of Houses in Multiple Occupation (HMOs) as well as providing information relating to Energy Performance Certificate (EPC) ratings.

The Housing Standards Variables and other information are derived from the BRE Dwelling Level Stock Models. These models have been used for many years to provide key Housing Standards Variables to local authorities. The most recent 2018 models have been updated to make use of the results of the 2015 English Housing Survey (EHS)⁵. The models also make use of Experian and Ordnance Survey (OS) data. OS AddressBase Plus is used as a basis for the list of all residential dwellings in the authority. OSMastermap is also linked to OS AddressBase to allow dwelling type and floor area to be determined for each dwelling through geographical modelling⁶. Other national data sources used by the Model include the age of postcodes (to improve dwelling age data) and data from Xoserve to determine whether the dwelling is on the gas network. These dwelling level models are used to estimate the likelihood of a dwelling meeting the criteria for each of the Housing Standards Variables. These outputs can then be mapped to provide the authority with a geographical distribution of each of the variables which can then be used to target resources for improving the housing stock.

As described above, in this particular case, the database was further enhanced by the addition of local data sources which were identified by Preston City Council. These local data sources were incorporated into the stock models to produce the integrated database.

The information in the HSCD can be used to ensure the council meets various policy and reporting requirements. For example, local housing authorities are required to review housing conditions in their districts in accordance with the Housing Act 2004⁷.

Furthermore, having this information available will also help to facilitate the delivery of Preston City Council's housing strategy. It will enable a targeted intervention approach to improving housing; therefore, allowing the council to concentrate their resources on housing in the poorest condition or with the greatest health impact.

⁵ 2015 is the latest available data. Prior to the 2018 models EHS 2014 data was used.

⁶ The OS data has been used to update a number of the model inputs – the main value of the OS data is the ability to determine the dwelling type with much greater confidence – see **Appendix B** for more information.

⁷ <http://www.legislation.gov.uk/ukpga/2004/34/contents>



1.1 Project aims

The main purpose of this project was to provide data on key private sector housing variables for Preston. The main aims were therefore to provide estimates of:

- The percentage of dwellings with the presence of each of the Housing Standards Variables for Preston overall, broken down by tenure and mapped by Census Output Area (COA) (private sector stock only)
- Information relating to LAHS reporting for the private sector stock - category 1 hazards and HMOs, plus information on EPC ratings

This report looks firstly at the policy background and why such information is important for local authorities. Secondly, it provides a brief description of the overall stock modelling approach and the integration of the local data sources. Finally, this report provides the modelling results for Preston covering each of the main aims above.



2 Policy background

The detailed housing stock information provided in this report will facilitate the delivery of Preston City Council's housing strategy and enable a targeted intervention approach to improving housing. This strategy needs to be set in the context of relevant government policy and legislative requirements. These policies either require reporting of housing-related data by local authorities, or the use of such data to assist in meeting policy requirements. The main policies and legislative requirements are summarised in the following sub-sections.

2.1 Housing Act 2004

The Housing Act 2004⁷ requires local housing authorities to review housing statistics in their district. The requirements of the Act are wide-ranging and also refer to other legislation which between them covers the following:

- Dwellings that fail to meet the minimum standard for housings (i.e. dwellings with HHSRS category 1 hazards)
- Houses in Multiple Occupation (HMOs)
- Selective licensing of other houses
- Demolition and slum clearance
- The need for provision of assistance with housing renewal
- The need to assist with adaptation of dwellings for disabled persons

2.2 Key housing strategy policy areas and legislation

2.2.1 Private rented sector

In the report "Laying the Foundations: A Housing Strategy for England"⁸ Chapters 4 and 5 focus on the private rented sector and empty homes.

New measures are being developed to deal with rogue landlords and to encourage local authorities to make full use of enforcement powers for tackling dangerous and poorly maintained dwellings. The report encourages working closely with landlords whilst still operating a robust enforcement regime (e.g. Landlord Forums and Panels across the country).

There has been significant growth in the private rented sector in Preston in recent years from 8% of the total stock in 2001 to 19% in 2011⁹ - so that 11% of the stock has changed over that time period to now be private rented. This is higher than the change of 9% seen in England as a whole. The analysis for this current report estimates that 25% of the stock in Preston is now privately rented, implying a further increase since 2011.

⁸ Laying the Foundations: A Housing Strategy for England, CLG, 2011

⁹ <https://www.ons.gov.uk/census#censusdataandbackground>



2.2.2 Health inequalities

The government's white paper "Choosing Health"¹⁰ states that the key to success in health inequalities will be effective local partnerships led by local government and the NHS working to a common purpose and reflecting local needs. Housing is a key determinant of health, and poor housing conditions continue to cause preventable deaths and contribute to health inequalities¹¹. An example in this area is the work carried out by Liverpool City Council in partnership with Liverpool Primary Care Trust – the "Healthy Homes Programme". This has identified over 3,800 hazards and led to an estimated £4.8 million investment by landlords, delivering sustainable health improvements and enhancing community wellbeing.

2.2.3 Integrated care

It has been recognised by central government that to fully address the health needs of the population, services need to become more integrated and there needs to be better communication between different providers. Housing is a key aspect of this:

"Many people with mental and physical disabilities, complex needs, long-term conditions and terminal illness also need to access different health care, social care, housing and other services, such as education, and often simultaneously"¹².

It is therefore essential that departments providing or regulating housing work with other council departments and health organisations to provide services that are integrated and take full account of the needs of the individual.

2.2.4 Public Health Outcomes Framework

The Public Health Outcomes Framework "Healthy lives, healthy people: Improving outcomes and supporting transparency"¹³ sets out desired outcomes for public health and how they will be measured. Many of the measurements have links to housing, some of the more relevant being:

- Falls and injuries in over 65's
- Fuel poverty
- Excess winter deaths

There have been minor indicator changes for 2019-2022, incorporating moderate to severe falls

2.2.5 Joint Strategic Needs Assessment (JSNA) and Joint Health and Wellbeing Strategies

The JSNA and joint health and wellbeing strategy allow health and wellbeing boards to analyse the health needs of their local population and to decide how to make best use of collective resources to achieve the priorities that are formed from these. The Department of Health document "Joint Strategic Needs Assessment and joint health and wellbeing strategies explained - Commissioning for populations" says

¹⁰ Choosing Health: Making healthy choices easier, Department of Health, 2004

¹¹ The health impacts of poor private sector housing, LACORS, 2010

¹² Integrated Care: Our Shared Commitment, Department of Health, 2013

¹³ Healthy lives, healthy people: Improving outcomes and supporting transparency, Department of Health, 2013



“This will ensure better integration between public health and services such as housing and education that have considerable impact on the wider determinants of health”¹⁴.

2.2.6 Energy Act 2011

The Energy Act 2011 requires that from 2016 reasonable requests by tenants for energy efficiency improvements will not be able to be refused. Furthermore, since 1 April 2018 it became unlawful for landlords to grant a new tenancy or renew an existing tenancy for a property that does not reach a minimum energy efficiency standard (MEES) of Energy Performance Certificate rating band E¹⁵. While there will be various caveats to these powers, they provide a new minimum standard for rented accommodation. If the EPC rating is an F or G, the landlord must improve the rating to a minimum of EPC E or register an exemption (if applicable) before they are able to let the property. From 1 April 2020, the regulations will apply to all domestic rented properties regardless of whether or not there has been a change in tenancy (again exemptions may apply but these must be registered by the landlord on the PRS exemptions register). Part of this current project for Preston City Council includes provision of a private rented sector variable that should assist in identifying such dwellings.

2.2.7 Empty homes

The need to bring empty private sector dwellings back into use is a key government objective that is part of a wider strategy to tackle housing affordability. It is generally accepted that in a time of housing shortage, empty dwellings represent a wasted resource.

Empty homes brought back into use will qualify for the New Homes Bonus where, for the following 4 years, the government will match the Council Tax raised on long term empty properties brought back into use. This was previously set at 5 years in 2017-19 and 6 years prior to that. Between 2012-15, £100 million of capital funding was available from within the Affordable Homes Programme to tackle problematic¹⁶ empty homes. There is no longer any separate funding for empty homes under the 2015-18 Affordable Homes Programme, although they are legitimate forms of Affordable Rent provision that could be included in bids for the 2015-18 Affordable Homes Programme¹⁷.

There are a number of issues in dealing with private sector vacant dwellings including the transient nature of vacant dwellings and their difficulty of identification. Properties are being continually bought and sold, let and modernised, which means that at any given time a proportion of the stock will be naturally vacant. The only dwellings that tend to be of most interest to local authorities are those that are not turning over in the normal way.

Whilst the data provided by this project cannot necessarily assist with the actual identification of empty homes, the HSCD would be the logical place for such information to be stored should it be gathered from other sources.

¹⁴ Joint Strategic Needs Assessment and joint health and wellbeing strategies explained: Commissioning for populations, Department of Health, 2011

¹⁵ <https://www.gov.uk/government/publications/the-private-rented-property-minimum-standard-landlord-guidance-documents>

¹⁶ Properties that are likely to remain empty without direct financial support from government.

¹⁷ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/343896/affordable-homes-15-18-framework.pdf



The latest available information for Preston for 2018, collected by MHCLG¹⁸, identifies 2,707 vacant dwellings across all tenures. This represents a vacancy rate of approximately 4% in Preston. In 2017 the number of vacant dwellings was 2,694, and 5 years ago in 2013 the figure was 2,193. Furthermore, around 1,150 (1.8%) dwellings are long-term vacant (6 months or more) in Preston (2018 figures).

The Affordable Homes Programme was replaced by the Shared Ownership and Affordable Homes Programme (2016-2021), supporting increased home ownership and aiming to expand supply of affordable homes in England. A total of £4.7 billion is available for the development of Shared Ownership and other affordable homes¹⁹.

2.3 Other policy areas

The following policy areas, whilst not directly relating to environmental health services, will have an effect on demand and local authorities will need to be aware of the possible impact in their area.

2.3.1 The Housing and Planning Act 2016

The Housing and Planning Act 2016²⁰ introduces legislation for government to implement the sale of higher value local authority homes, starter homes, pay to stay and a number of other measures, mainly intended to promote home ownership and boost levels of housebuilding in England. Although many of the measures have yet to be implemented or come into effect, the following policy changes will have a significant impact on the way councils deliver their Housing Services:

- Extension of the Right-to-Buy scheme to housing associations through a voluntary agreement, funded by the sale of higher value council properties when they become vacant
- The ending of lifetime tenancies – all new tenants will have to sign tenancies for a fixed term up to 10 years although there will be exemptions for people with disabilities and victims of domestic abuse, and families with children under nine years old can have a tenancy that lasts until the child's 19th birthday
- Changes to planning measures so that the government can intervene where councils have not adopted a Local Plan
- To replace the need for social rented and intermediate housing on new sites with the provision of Starter Homes that are sold at a reduced cost to first time buyers
- Changing the definition of 'affordable homes' to include starter homes
- Increasing the site size threshold before affordable housing can be requested

The Act also includes a package of measures to help tackle rogue landlords in the private rented sector. This includes:

- Allowing local authorities to apply for a banning order to prevent a particular landlord/letting agent from continuing to operate where they have committed certain housing offences
- Creating a national database of rogue landlords/letting agents, which will be maintained by local authorities
- Allowing tenants or local authorities to apply for a rent repayment order where a landlord has committed certain offences (for example continuing to operate while subject to a banning order or

¹⁸ <https://www.gov.uk/government/collections/dwelling-stock-including-vacants>

¹⁹ <https://www.gov.uk/government/collections/shared-ownership-and-affordable-homes-programme-2016-to-2021-guidance>

²⁰ <http://www.legislation.gov.uk/ukpga/2016/22/contents/enacted/data.htm>



ignoring an improvement notice). If successful the tenant (or the authority if the tenant was receiving universal credit) may be repaid up to a maximum of 12 months' rent

- Introducing a new regime giving local authorities an alternative to prosecution for offences committed under the Housing Act 2004, including all HMO offences. Effectively, local authorities will have a choice whether to prosecute or impose a penalty with a maximum fine of £30,000. The local authority can also retain the money recovered, which is not currently the case with fines imposed in the magistrates' court

2.3.2 The Welfare Reform and Work Act 2016 and the Welfare Reform Act 2012

The Welfare Reform and Work Act 2016²¹ gained royal assent in March 2016. The Act introduces a duty to report to Parliament on progress made towards achieving full employment and the three million apprenticeships target in England. The Act also ensures reporting on the effect of support for troubled families and provision for social mobility, the benefit cap, social security and tax credits, loans for mortgage interest, and social housing rents. These include the following:

- Overall reduction in benefits – a four year freeze on a number of social security benefits
- Benefit cap reduction – the total amount of benefit which a family on out of work benefits can be entitled to in a year will not exceed £20,000 for couples and lone parents, and £13,400 for single claimants, except in Greater London where the cap is set at £23,000 and £15,410 respectively
- Local Housing Allowance rent cap – this is the locally agreed maximum benefit threshold for a dwelling or household type within a defined geographical area. Therefore, if rises in rent outstrip growth in income, renters may find it increasingly difficult to pay
- A 1% reduction in social rents per year for 4 years to reduce the housing benefit bill

In addition, the Welfare Reform Act 2012²² (which is in parts amended by the 2016 Act discussed above) covers areas of environmental health services – in particular the sections relating to the under occupation of social housing, and the benefit cap. Whilst this will mainly affect tenants in the social rented sector it will undoubtedly have an impact on private sector services. Social tenants may find themselves being displaced into the private sector, increasing demand in this area, and the tenants of Registered Providers (RP's) and some private landlords may have greater trouble affording rent payments. If tenants are in arrears on their rental payments then authorities may be met with reluctance from landlords when requiring improvements to properties.

2.3.3 Localism Act 2011

The Localism Act allows social housing providers to offer fixed term, rather than secure lifetime, tenancies. As with the Welfare Reform Act, this has a greater direct impact on the social rented sector, however, there is some concern this may lead to greater turnover of tenancies meaning such that some traditional social tenants may find themselves in the private rented sector.

Both of these policy changes above may increase the number of vulnerable persons in private sector properties. If this occurs any properties in this sector in poor condition are likely to have a far greater negative impact on the health of those occupiers.

²¹ <http://www.legislation.gov.uk/ukpga/2016/7/contents/enacted>

²² <http://www.legislation.gov.uk/ukpga/2012/5/contents/enacted>



2.3.4 Potential increase in private rented sector properties

Policies such as the Build to Rent and the New Homes Bonus are aimed at increasing the supply of properties. As the private rented sector is already growing, it is reasonable to assume that many of the new properties being built will be rented to private tenants. Local authorities will need to be aware of the potential impact on the demand for their services and how their perception of their local area may have to change if large numbers of properties are built.

2.4 Local Authority Housing Statistics (LAHS)²³ and EPC ratings

The purpose of these statistics is twofold – firstly to provide central government with data with which to inform and monitor government strategies, policies and objectives as well as contributing to national statistics on housing, secondly, to the local authorities themselves to help manage their housing stock. Local authorities are required to complete an annual return which covers a wide range of housing-related issues. Of particular relevance to this current project is “Section F: Condition of dwelling stock” which, amongst other things, requests the following information:

- Estimates of the number of HMOs and the number of mandatory licensable HMOs

Whilst the LAHS no longer requires reporting of total number of dwellings and number of private sector dwellings with category 1 HHSRS hazards and the estimated costs of mitigating these, this information is still of use to understand the extent of these hazards within a local authority.

The LAHS no longer requires reporting of average EPC ratings of the private sector stock and the proportion below a certain rating; however, this information remains pertinent due to the Energy Act 2011. Under this act, from 1 April 2018 landlords must ensure that their properties meet a minimum energy efficiency standard when they grant a tenancy to new or existing tenants - which has been set at band E^{24, 25}. From 1 April 2020, landlords can no longer continue letting a property which is already let if it has an EPC rating of F or G²⁶. Furthermore, from 1 April 2016, tenants in F and G rated dwellings may legally request an upgrade to the dwelling to a minimum of a band E. Results relating to LAHS statistics and EPC ratings can be found in **Section 4.2**.

2.5 The Energy Company Obligation (ECO)

The Energy Companies Obligation (ECO) requires energy companies to assist in the installation of energy efficiency measures in Great Britain to low income and vulnerable households or those living in hard-to-treat (HTT) properties. Under the ECO, energy companies are obliged to meet targets expressed as carbon or costs saved. There have been several ECO schemes to date, with a new scheme set to start in October 2018:

²³ <https://www.gov.uk/government/publications/completing-local-authority-housing-statistics-2012-to-2013-guidance-notes>

²⁴ <http://www.legislation.gov.uk/ukxi/2015/962/contents/made>

²⁵ Although landlords will still be able to rent out F and G rated properties after this date they will not be able to renew or sign a new contract.

²⁶

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794253/domestic-prs-minimum-standard-guidance.pdf



- ECO1 - ran from January 2013 to March 2015
- ECO2 - launched on 1 April 2015 and ended on 31 March 2017
- ECO2t - was an 18 month extension to the ECO2 scheme until September 2018²⁷, ²⁸ as a transition period between the end of ECO2 and a new scheme.
- ECO3²⁹- launched in October 2018 and will run for 3.5 years to the end of March 2022

Current scheme – ECO3

ECO3 has 4 phases terminating in March of each year (2019-2022). The scheme focusses on Affordable Warmth (the Carbon Emissions Reduction Obligation – CERO – has been removed) so that low income and vulnerable households are the recipients of the main benefits. The scope of the Affordable Warmth group will be expanded to include other benefits (e.g. Child Benefit, Personal Independence Payment, etc.).

In terms of measures and improvements, the focus is on replacing electric storage heaters with central heating, improving 17,000 solid wall dwellings every year, replacing broken heating systems (maximum of 35,000 per year), encouraging the replacement of heating systems only when also installing certain types of insulation. In addition, Renewable Heat Incentive measures would not be eligible under ECO3, and suppliers will be able to meet up to 10 – 20% of their obligation through “innovative measures”.

Energy companies can also use the local authority Flexible Eligibility mechanism to achieve up to 25% of their obligation – allowing councils to outline personal criteria to maximise inclusion of vulnerable people in funding for domestic heating and insulation upgrades.

The results for the basic energy efficiency variables are covered in this report and assist in the identification of dwellings which may benefit from energy efficiency improvements. Such information also provides a valuable contribution to the evidence base increasingly being required to support competitive funding bids to central government for housing improvements.

²⁷ Energy Company Obligation (ECO): Help to Heat: <https://www.gov.uk/government/consultations/energy-company-obligation-eco-help-to-heat>

²⁸

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/586266/ECO_Transition_Final_Stage_IA_For_Publication_.pdf

²⁹ <https://www.gov.uk/government/consultations/energy-company-obligation-eco3-2018-to-2022>



3 Overview of the BRE Dwelling Level Housing Stock Modelling approach

3.1 Overview

This section provides a simplified overview of the BRE dwelling level housing stock modelling approach. More detail on the methodology is provided in **Appendix B**.

A stock modelling approach has been developed and used by BRE for many years and dwelling level models are used to estimate the likelihood of a particular dwelling meeting the criteria for each of the Housing Standard Variables (and other outputs of interest). These outputs can then be mapped to provide the council with a geographical distribution of each of the variables which can then be used to target resources for improving the housing stock. The process is made up of a variety of data sources, calculations and models.

The models are principally informed by the Ministry of Housing, Communities and Local Government's (MHCLG) English Housing Survey (EHS)³⁰. The EHS dataset is used to identify patterns in the housing stock for those which fail a given indicator, for example HHSRS. This knowledge can be applied, using statistical methods, to impute Housing Standards Variables and energy characteristics from other data available at dwelling level which cover the whole of England. To model energy efficiency of dwellings, BRE have developed a variant of the BREDEM³¹ software, named "SimpleCO₂", that can calculate energy outputs from a reduced set of input variables.

The modelled dwelling level data provided for Preston makes significant use of the Experian UK Consumer Dynamics Database of dwelling and household indicators, as well as OS datasets as inputs to the models.

Preston City Council also provided additional sources of local data which were incorporated into the BRE Housing Stock Model and Database, as well as the EPC data, to produce an integrated housing stock model and database. The additional data provided and how it was used is as follows:

- **EPC data** – EPCs contain data on key dwelling energy characteristics (e.g. wall type and insulation, loft insulation, heating types etc.) and where these were available they were used in preference to the modelled data. It should be noted that to comply with bulk EPC data licencing requirements the EPC data is only used to inform the energy efficiency aspects of the model.
- **Tenure data** – the council provided lists of addresses from one of the three tenure deposit schemes available at the time of project inception. This data was used to inform the tenure variable.

Figure 1 shows a simplified flow diagram of the overall BRE housing stock modelling approach and how the additional data is incorporated to produce the integrated Housing Stock Condition Database (HSCD).

³⁰ The most recent survey used in the housing stock models is 2015.

³¹ BREDEM - Building Research Establishment Domestic Energy Model, BRE are the original developers of this model which calculates the energy costs of a dwelling based on measures of building characteristics (assuming a standard heating and living regime). The model has a number of outputs including an estimate of the SAP rating and carbon emissions.



The process is made up of a series of data sources and models which, combined with various imputation and regression techniques and the application of other formulae, make up the final database. The database is essentially the main output of the modelling and provides information on the Housing Standards Variables and other data requirements (e.g. energy efficiency variables). More detailed information on the data sources and models is provided in **Appendix B**, but to summarise:

The data sources are:

EHS, EPC, Experian, Ordnance Survey (OS) MasterMap, other local data (if available)

The Models are:

SimpleSAP, Fuel Poverty, HHSRS (all hazards, falls hazards and excess cold), Disrepair and Low Income Households.

The data sources and models are linked as shown in the flow diagram and the modelling process itself can be divided into “energy inputs” and “other inputs”, which are summarised as follows:

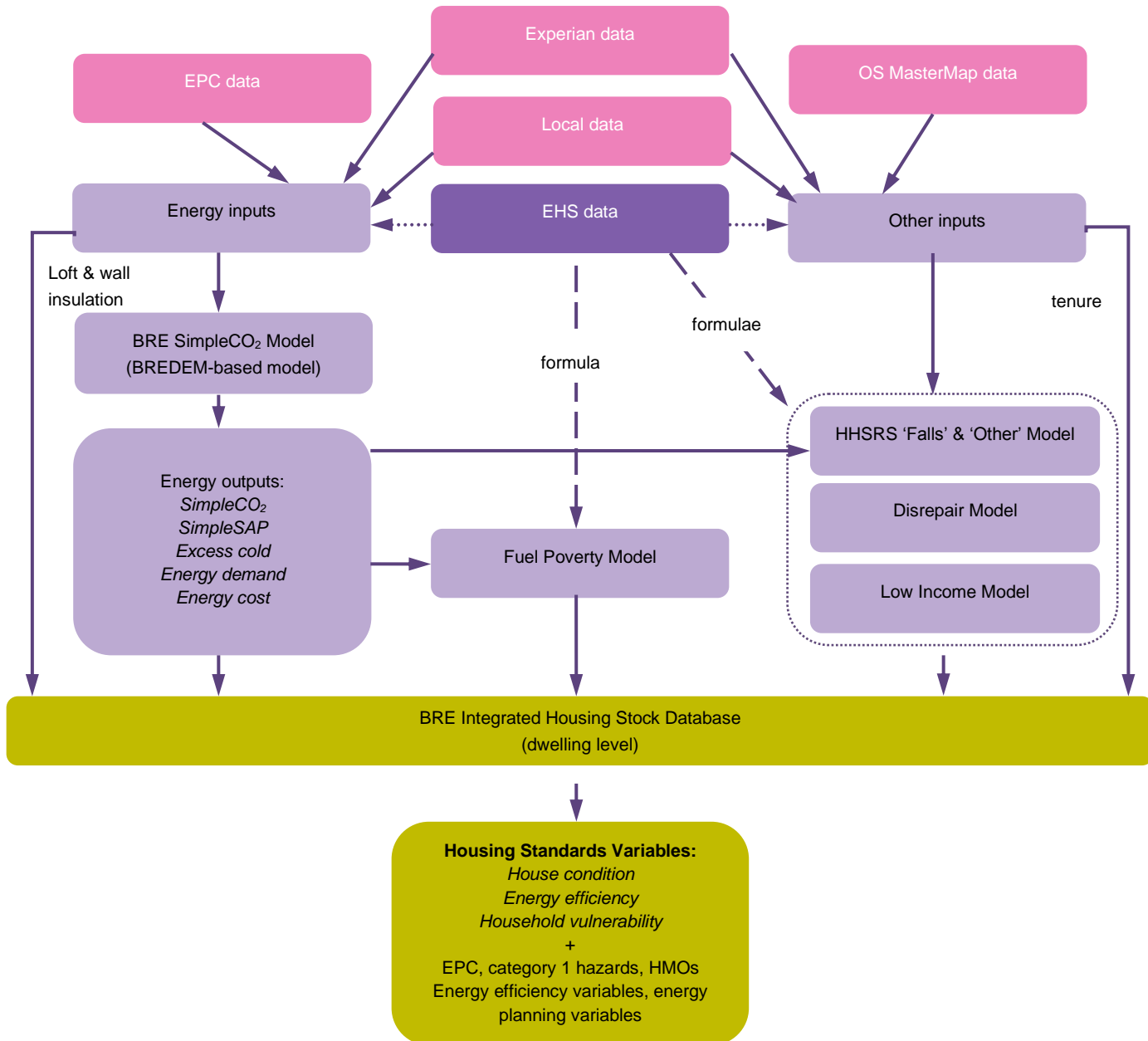
Energy inputs - are developed from Experian, EPC and other local data sources (if available). The EHS data is used to impute (using cold deck imputation³²) and interpolate where there are gaps in the data. The “energy inputs” are then fed into the SimpleCO₂ Model to produce the “energy outputs” for the database plus information on excess cold for the HHSRS Model and information on energy costs for the Fuel Poverty Model.

Other inputs – are developed from Experian, OS MasterMap and other local data sources. The EHS data is used to impute (using cold deck imputation³²) and interpolate where there are gaps in the data. The “other inputs” are then fed into the HHSRS, Disrepair, and Low Income Models (note that tenure data is fed directly into the database). Information from the EHS also feeds into the Fuel Poverty, HHSRS, Disrepair and Low Income Models.

³² Cold deck imputation is a process of assigning values in accordance with their known proportions in the stock.



Figure 1: Simplified flow diagram of overall BRE housing stock modelling approach (N.B. the EHS data is only used to inform the mathematical algorithms of the model – it does not provide data)



- BRE housing stock modelling process
- Integration of additional data
- Data used for imputation & interpolation
- Outputs
- Data
- Imputed (cold deck)
- Information



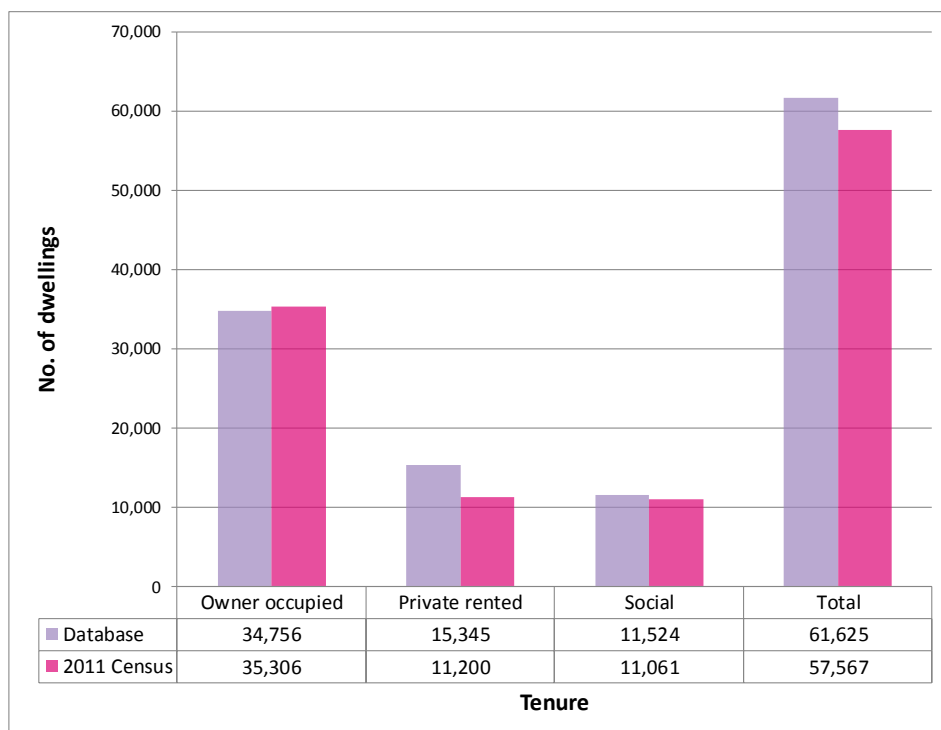
3.2 Breakdown of the housing stock by tenure - validation

Providing the results split by tenure is useful since it can have an effect on how resources and improvement policies are targeted. This report is particularly focussed on private sector stock which is made up of owner occupied and private rented dwellings. The remainder of the housing stock consists of social housing.

The total number of dwellings in Preston from the integrated housing stock condition database is based on OS AddressBase; therefore the model is based on this value. The tenure split within the integrated database is derived from the purchased Experian tenure variable for addresses where tenure has not been supplied by the council.

Since it is possible for private rented dwellings to become owner occupied and vice versa relatively easily, it is difficult to accurately predict the actual tenure split at any given point in time. A validation process was undertaken to compare the tenure split from the database to the 2011 Census figures³³. The results of the validation exercise show the differences between the tenure split from the database compared to the Census figures. There has been a noticeable increase in the size of the stock, mainly comprised of increases in the size of the private rented tenure (see **Figure 2**). Furthermore, **Maps 1** and **2** show the geographical distributions of the private rented sector which look similar, especially in the urban parts of the area, again giving confidence that the integrated database provides a good overview of the housing stock in Preston.

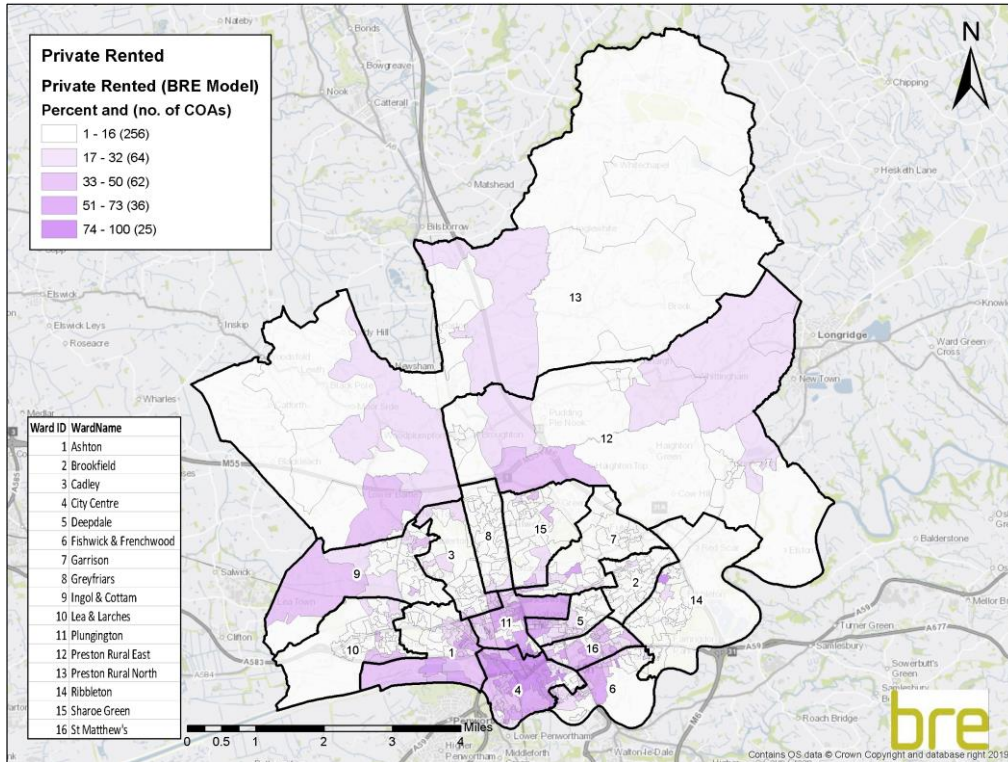
Figure 2: Tenure split – comparison of BRE Housing Stock Condition Database outputs with 2011 Census figures for Preston



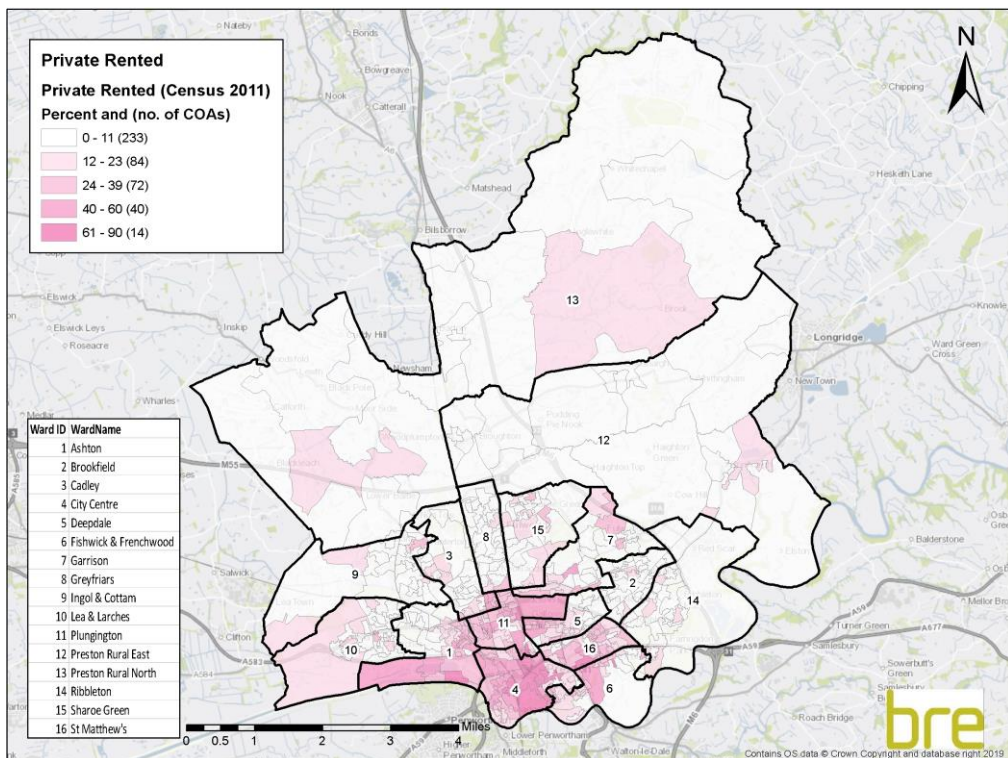
³³ <http://www.ons.gov.uk/ons/datasets-and-tables/index.html>



Map 1: Distribution of estimated percentage of private rented dwellings in Preston – based on database



Map 2: Distribution of estimated percentage of private rented dwellings in Preston – based on 2011 Census Data (Neighbourhood Statistics)





3.2.1 Other national datasets relating to tenure

In addition to the Census data there are other national datasets available which provide information on tenure; these are MHCLG returns³⁴ and Office for National Statistics (ONS) data³⁵. These datasets are not used directly in the model but are reported here for the purposes of comparison.

The MHCLG returns provide estimates of the tenure split by private sector and social sector only, with the former being based on projections from the 2011 census as a starting point, and the latter being based on Local Authority Housing Statistics. The tenure split used in the BRE Housing Stock Model is compared to this at an early stage of the project in order to ensure the tenure split is consistent³⁶.

The ONS data provides subnational (local authority level) data on the dwelling stock broken down into tenure. The ONS split between owner occupied and private rented stock is based on their Annual Population Survey (APS)³⁷ which is then benchmarked to the MHCLG returns. The APS is based on “persons who regard the sample address as their main address and also those who have lived in the dwelling for more than 6 consecutive months, even if they do not regard this as their principal dwelling”. This methodology may under-estimate the proportion of private rented dwellings for several reasons:

1. By only including those people who have lived in a dwelling for more than 6 consecutive months, the number of private rented households may be under-estimated as there tends to be a higher turnover in this sector.
2. By only including persons who regard the sample address as their main address there are two groups where this may have an impact on the estimated figures:
 - a. Students renting away from home who assume their parents’ address to be their main residence.
 - b. Commuter areas where households may have a city flat during the week and also have a suburban family home which they class as their first residence. Commuter towns close to large cities may also have higher levels of private rented stock with a high turnover of tenants near rail stations for example.

In addition, the ONS dataset uses EHS data but this is limited to using the occupancy rate to allow for vacant dwellings as their APS is based on individuals and therefore does not account for vacant dwellings.

³⁴ <https://www.gov.uk/government/statistical-data-sets/live-tables-on-dwelling-stock-including-vacants>

³⁵

<https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/researchoutputsubnationaldwellingstockbytenureestimatesengland2012to2015/2017-12-04#methodology>

³⁶ This comparison is checked early on in the project through email correspondence with the authority.

³⁷

<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/methodologies/annualpopulationsurveyapsqmi>



It is important to note that the ONS data is not an official statistic and that a disclaimer³⁸ must be used when reproducing the data (note that the “dwelling stock by tenure” in the disclaimer refers to the MHCLG returns data).

Table 2 shows the latest tenure splits from the MHCLG and ONS data for Preston. Since the ONS data is benchmarked to the MHCLG returns, the figures for the private sector stock match. The private sector figures for both MHCLG and ONS are close to the BRE figure of 81%. However, the split between the owner occupied and private rented sectors in the ONS data is different to the BRE Database which estimates a higher proportion of private rented dwellings (25% compared to 17%). This difference is likely to be a result of the large student population in Preston attending the University of Central Lancashire (one of the largest in the UK with over 32,000 students) as well as Preston college (one of the largest colleges in England)³⁹. This means that students renting away from home may be registered at their parents’ address as their “main address” and as a result may not be included as private rented in the ONS data.

Table 2: Comparison of MHCLG, ONS and BRE Database figures on tenure split for Preston *N.B. MHCLG data does not break down private sector into owner occupied and private rented stock and ONS data does not provide an estimate for social stock*

Tenure	Number of dwellings			% of all stock		
	2017 MHCLG	2017 ONS	BRE Database	2017 MHCLG	2017 ONS	BRE Database
Owner occupied	51,050	40,130	34,756	82%	64%	56%
Private rented		10,920	15,345		17%	25%
Social	11,530	-	11,524	18%	-	19%

³⁸ ONS Disclaimer: “We have published these Research outputs to provide an indication of the tenure breakdown of dwellings within the private sector at the subnational level. Research Outputs are produced to provide information about new methods and data sources being investigated. Official statistics on private dwellings by tenure are currently only available at the country level. Statistics on **dwelling stock by tenure**³⁴ are available for local authorities but do not provide a breakdown of owner-occupied and privately rented dwellings. These statistics are subject to marginal error as they are estimates based on a survey, therefore users should refer to the coefficient of variation (CV) and confidence intervals when making interpretations.”

³⁹ <https://www.lancashire.gov.uk/lancashire-insight/area-profiles/local-authority-profiles/preston-district/>



4 Results from the BRE Dwelling Level Housing Stock Models and Housing Stock Condition Database (HSCD)

As described in the previous section, the housing stock modelling process consists of a series of different stock models with the main output being the HSCD. The results in this section have been obtained from interrogating the database at the level of the local authority as a whole to give a useful overview for Preston. Information at ward level, however, is provided in the maps, in **Section 4.2.4** and can also be obtained from the HSCD which has been supplied as part of this project (see **Appendix C** for instructions). The HSCD can be interrogated at local authority, ward, medium super output area (MSOA), lower super output area (LSOA), census output area (COA), postcode or dwelling level.

The first sub-section below provides a map of the wards in Preston. The results are then displayed in the following sub-sections:

- Housing Standards Variables:
 - Preston – regional and national comparisons
 - Housing Standards Variables by tenure for Preston
 - Housing Standards Variables mapped by COA for Preston private sector stock
 - Ward level results for the Housing Standards Variables

- Information relating to LAHS reporting and EPC ratings:
 - Category 1 hazards
 - HMOs
 - EPC ratings

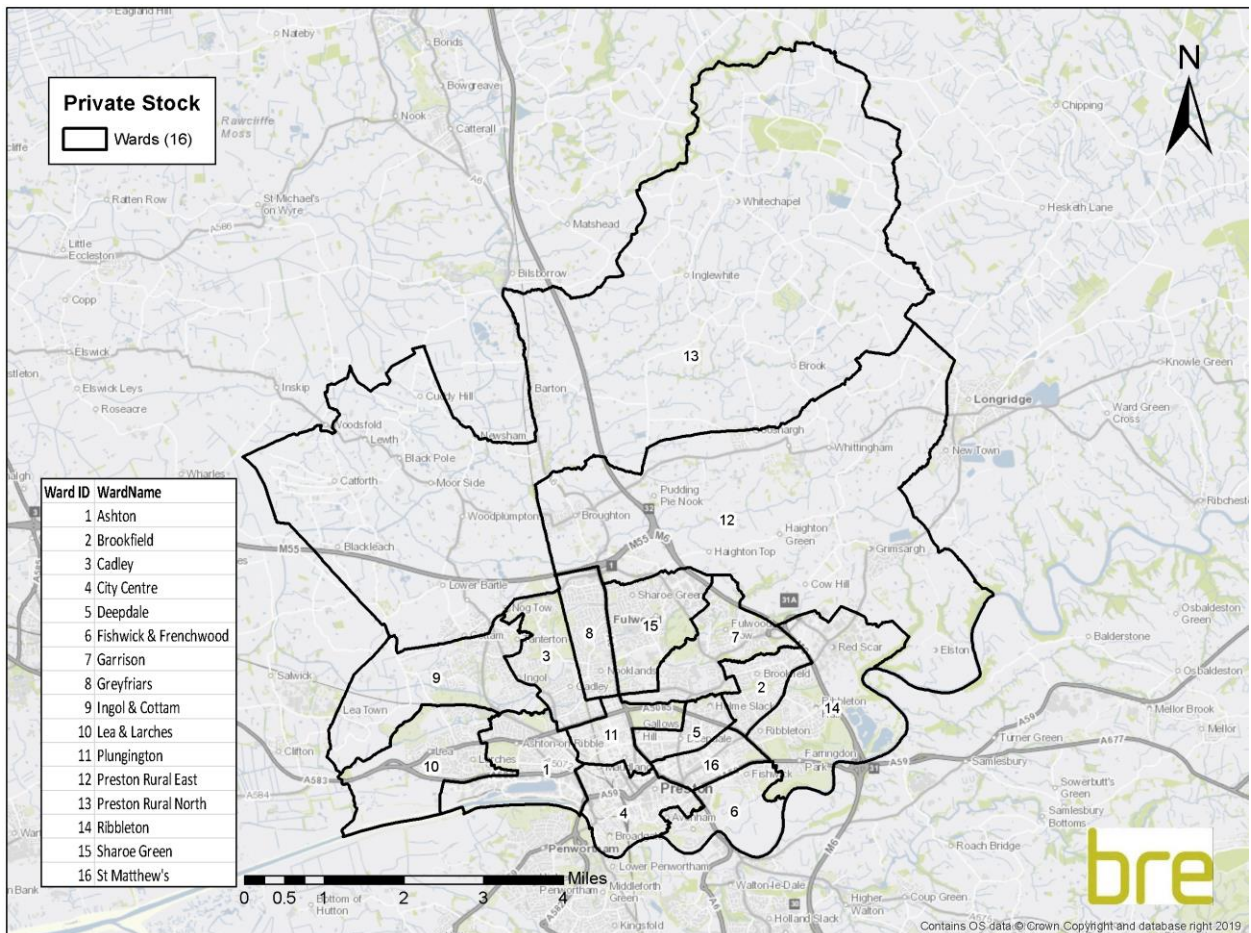


4.1 Overview of Preston

Map 3 below shows the 16 wards in Preston. The data in the report is separated into wards and then further divided into Census Output Areas (COAs). These typically comprise around 125 households and usually include whole postcodes, which have populations that are largely similar. Where the COAs are smaller in size on the map this typically represents a more densely populated area since each COA represents a similar number of dwellings.

It should be noted that some residential addresses are not considered suitable for modelling and these have been removed. These include caravans and house boats which, whilst covered by the EHS, are quite uncommon, and the energy models and other key variables were not developed with dwellings such as these in mind. Residential institutions (e.g. care homes) have also been removed as it is not entirely appropriate to apply the usual models to these dwellings. The removal of these addresses may result in a COA not appearing to contain any dwellings due to the fact that all c.125 households are made up of caravans for example.

Map 3: The wards in Preston





4.2 Housing Standards Variables

4.2.1 Preston – regional and national comparisons

Table 3 and **Figure 3** show the results for each of the Housing Standards Variables in Preston compared to the North West region and to England (EHS 2015) and split into all stock and private sector stock.

Figure 4 shows the results of the SimpleSAP ratings.

For all stock, the performance of the housing stock in Preston compared to the EHS England average is mixed. Preston performs similarly for excess cold (3%) and fuel poverty (Low Income High Cost (LIHC)) (11%), but worse for all other variables, particularly low income households (31% compared to 26%).

When comparing Preston to the North West region, the picture is slightly different with Preston performing better for all hazards, disrepair and fuel poverty (both definitions) but worse for excess cold and low income households.

Comparing Preston to the EHS England average figures for the private sector stock Preston performs slightly better for excess cold, similarly for fuel poverty (LIHC definition), but worse for the other variables, in particular all hazards (16% compared to 13%) and low income households (22% compared to 17%).

Compared with the regional average, the private stock in Preston has slightly higher rates of excess cold (3% compared to 2%) and low income (22% compared to 20%) but similar or lower levels of the other variables.

The average SimpleSAP ratings in Preston (**Figure 4**) are the same as the England average and lower than the regional average for all stock. For the private stock, the average SimpleSAP in Preston is the same as the regional figure and higher than the England average.

Table 3: Estimates of the numbers and percentage of dwellings with the presence of each of the Housing Standards Variables assessed by the Housing Stock Models and HSCD for all stock and private sector stock – Preston compared to the North West and England (EHS 2015)

Variable	All stock				Private sector stock				
	Preston (no.)	Preston (%)	2015 EHS Regional (%)	2015 EHS England (%)	Preston (no.)	Preston (%)	2015 EHS Regional (%)	2015 EHS England (%)	
No. of dwellings	61,625	-	-	-	50,101	-	-	-	
HHSRS category 1 hazards	All hazards	8,440	14%	15%	12%	7,793	16%	17%	13%
	Excess cold	1,639	3%	2%	3%	1,536	3%	2%	4%
	Fall hazards	5,295	9%	9%	7%	4,815	10%	10%	8%
Disrepair	3,332	5%	6%	4%	3,191	6%	7%	4%	
Fuel poverty (10%)	7,128	12%	13%	10%	5,891	12%	14%	10%	
Fuel poverty (Low Income High Costs)	6,845	11%	12%	11%	5,600	11%	12%	11%	
Low income households	19,175	31%	30%	26%	10,872	22%	20%	17%	

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under ‘all hazards’. The number of dwellings under ‘all hazards’ can therefore be less than the sum of the excess cold plus fall hazards.



Figure 3: Estimates of the percentage of dwellings with the presence of each of the Housing Standards Variables assessed by the Housing Stock Models and HSCD for all stock and private sector stock – Preston compared to the North West and England (EHS 2015)

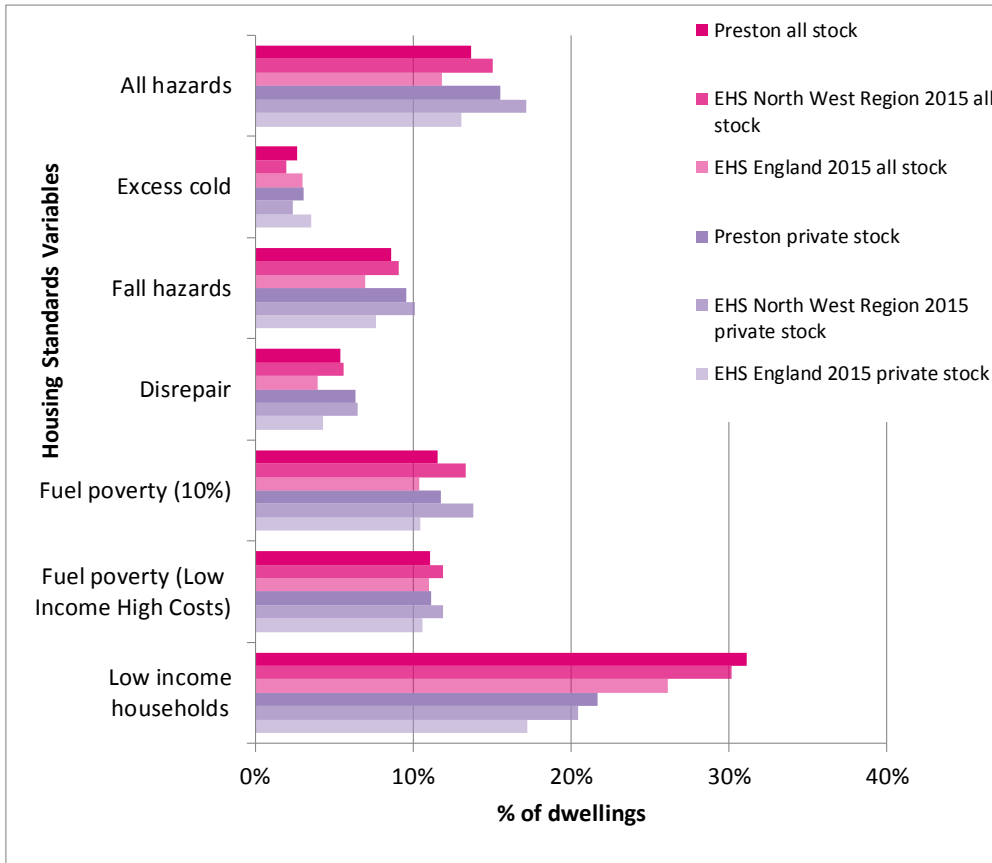
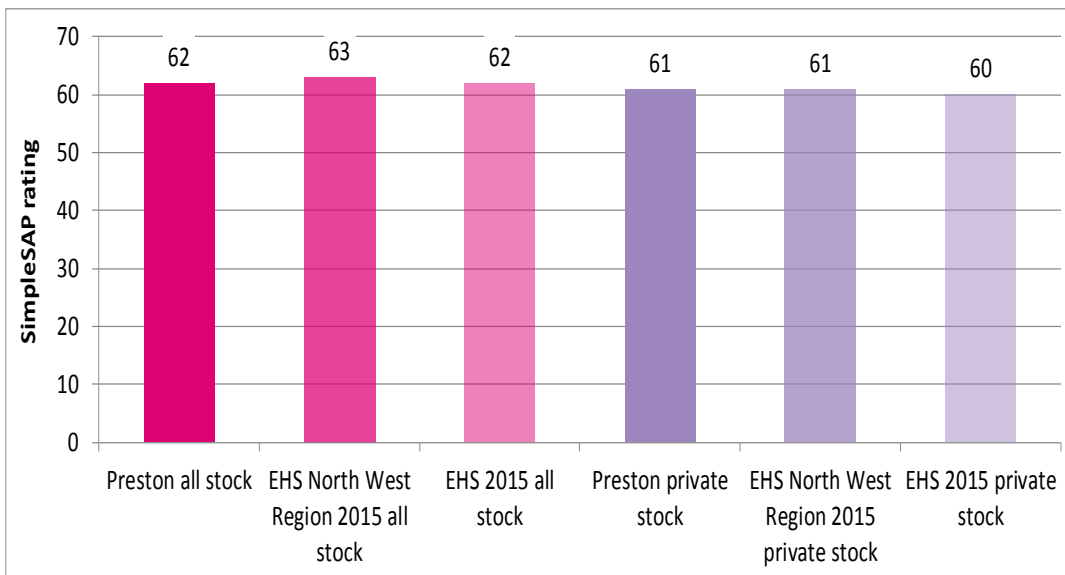


Figure 4: Average SimpleSAP ratings for all stock and private sector stock – Preston compared to the North West and England (EHS 2015)





4.2.2 Housing Standards Variables by tenure – Preston

The private sector stock can be further split by tenure – owner occupied and private rented - with the difference between total private sector stock and total housing stock being the social housing stock.

Table 4 and **Figure 5** below show the results for each of the Housing Standards Variables split by tenure and **Figure 6** shows the SimpleSAP ratings by tenure.

The social stock is generally better than the private sector stock across the majority of variables including SimpleSAP. Social stock tends to be more thermally efficient than the private stock partly due to the prevalence of flats, and partly due to being better insulated owing to the requirements placed on social housing providers, for example through the Decent Homes Programme. As would be expected, the social stock is significantly worse than the private sector stock for the low income households variable. For fuel poverty, however, the owner occupied tenure shows the highest levels for the 10% definition and the private rented tenure shows the highest levels for the LIHC definition.

The social data should be treated with some caution as the social rented stock, particularly when largely comprising stock owned by a single landlord, is more difficult to model than the private sector. This is because the decisions of an individual property owner usually only affect a single dwelling out of the thousands of private sector stock whereas the policies and decisions of a single landlord can have a very great effect on a large proportion of the social stock. The social rented results are therefore best considered as a benchmark which takes account of the age, type, size and tenure against which the landlord's own data could be compared.

Focussing on the tenures within the private sector stock, the owner occupied stock has slightly higher levels of fall hazards and fuel poverty (10% definition), but lower levels of all hazards, disrepair and fuel poverty (LIHC definition). The private rented stock has a much higher proportion of low income households compared to the owner occupied stock.

Table 4: Estimates of the numbers and percentage of dwellings with the presence of each of the Housing Standards Variables assessed by the Housing Stock Models and HSCD by tenure for Preston

Variable		Private sector stock				Social stock	
		Owner occupied		Private rented		No.	%
		No.	%	No.	%		
No. of dwellings		34,756	-	15,345	-	11,524	-
HHSRS category 1 hazards	All hazards	5,281	15%	2,512	16%	647	6%
	Excess cold	1,108	3%	428	3%	103	1%
	Fall hazards	3,380	10%	1,435	9%	480	4%
Disrepair		1,959	6%	1,232	8%	141	1%
Fuel poverty (10%)		4,289	12%	1,602	10%	1,237	11%
Fuel poverty (Low Income High Costs)		3,571	10%	2,029	13%	1,245	11%
Low income households		6,000	17%	4,872	32%	8,303	72%

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.



Figure 5: Estimates of the percentage of dwellings with the presence of each of the Housing Standards Variables assessed by the Housing Stock Models and HSCD by tenure for Preston

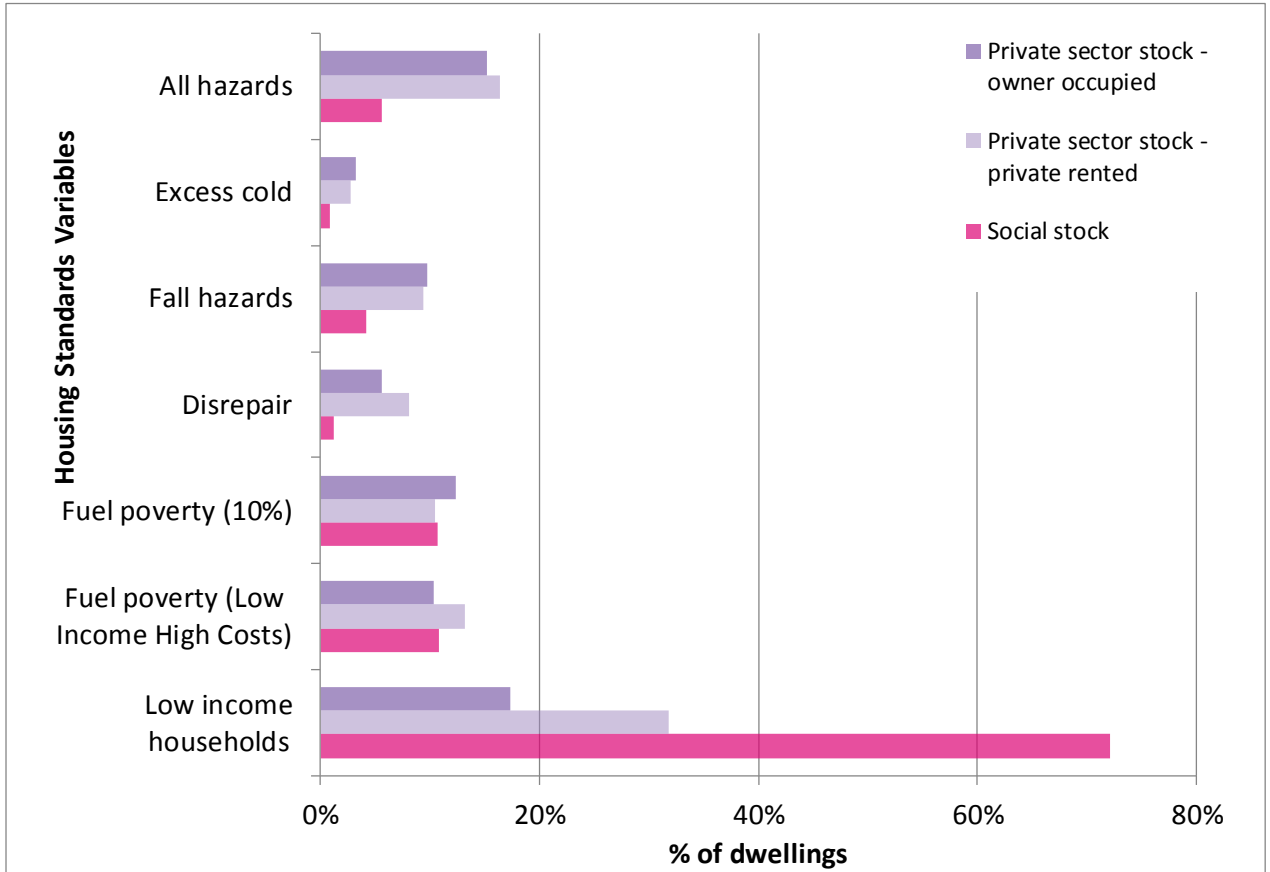


Figure 6: Average SimpleSAP ratings by tenure for Preston





4.2.3 Housing Standards Variables mapped by Census Output Area (COA) – Preston private sector stock

Some of the Housing Standards Variables are also provided in map form below along with a brief description of each variable⁴⁰, thus enabling quick observation of the geographical distribution of properties of interest. The maps show the percentages of private sector dwellings in each Census Output Area (COA) that are estimated to have each of the Housing Standards Variables.

The ranges shown in the map keys are defined based on the Jenks' Natural Breaks algorithm of the COA statistics⁴¹. The outputs in the lightest and darkest colours on the maps show the extreme ends of the range, highlighting the best and the worst areas.

Maps at COA level are provided for the following variables in **Map 4** to **Map 12** below:

- **HHSRS**
 - The presence of a category 1 HHSRS hazard
 - The presence of a category 1 hazard for excess cold
 - The presence of a category 1 hazard for falls
- **Levels of disrepair**
- **Levels of fuel poverty** (LIHC and 10% definitions)
- **Low income households**
 - Dwellings occupied by low income households
 - Dwellings with a category 1 excess cold hazard that are occupied by a low income household
- **The average SimpleSAP⁴² rating**

In addition, maps have been provided for HMOs.

These maps are extremely useful in showing the geographical distribution for single variables. Maps can also be produced for a combination of variables, such as dwellings with an excess cold hazard which are also occupied by low income households, as shown in **Map 11**. **Appendix D** provides close up maps for each variable, focussing on the southern urban area of Preston City.

The maps are produced at COA level, which is typically made up of 125 households, usually including whole postcodes and having similar sized populations. Using the first map below (**Map 4**) as an example,

⁴⁰ See **Appendix A** for full definitions.

⁴¹ The natural breaks classification method is a data clustering method determining the best arrangement of values into different classes. It is achieved through minimising each class's average deviation from the class mean while maximising each class's deviation from the means of the other groups. The method seeks to reduce the variance within classes and maximise variance between classes thus ensuring groups are distinctive.

⁴² Important note: Whilst it is possible to provide "SimpleSAP" ratings from the "SimpleCO₂" software, under no circumstances must these be referred to as "SAP" as the input data is insufficient to produce an estimate of SAP or even RdSAP for an individual dwelling that meets the standards required by these methodologies.



it can be seen that each ward is split into several COAs and, in this instance there are 7 COAs that have 35-65% of private sector dwellings estimated to have the presence of a category 1 hazard.

The maps also highlight the differences between areas, showing that the results for some areas are much worse than for others and these are the specific areas which might warrant attention. The maps also show that even within wards there can be large differences between the results at COA level.

4.2.3.1 HHSRS

The Housing Health and Safety Rating System (HHSRS) is a risk-based evaluation tool to help local authorities identify and protect against potential risks and hazards to health and safety from any deficiencies identified in dwellings. It was introduced under the Housing Act 2004⁷ and applies to residential properties in England and Wales.

The HHSRS assesses 29 categories of housing hazard. Each hazard has a weighting which will help determine whether the property is rated as having a category 1 (serious) hazard⁴³.

The HHSRS category 1 hazards map (**Map 4**) shows that there are concentrations of high levels of category 1 hazards scattered across the area but with higher concentrations towards the city of Preston and to the north of the area. The data behind the map shows that the wards with the highest levels overall are Preston Rural North, Deepdale and Fishwick & Frenchwood, with City Centre, Ashton and St. Matthew's wards also having high levels. **Map D. 1** focusses in on the urban area of Preston and it can be seen that in Deepdale ward the highest levels are in central and western COAs, in Fishwick & Frenchwood ward COAs with the highest levels of hazards are to the north and west. In City Centre ward, COAs with higher levels are concentrated towards the centre of the ward.

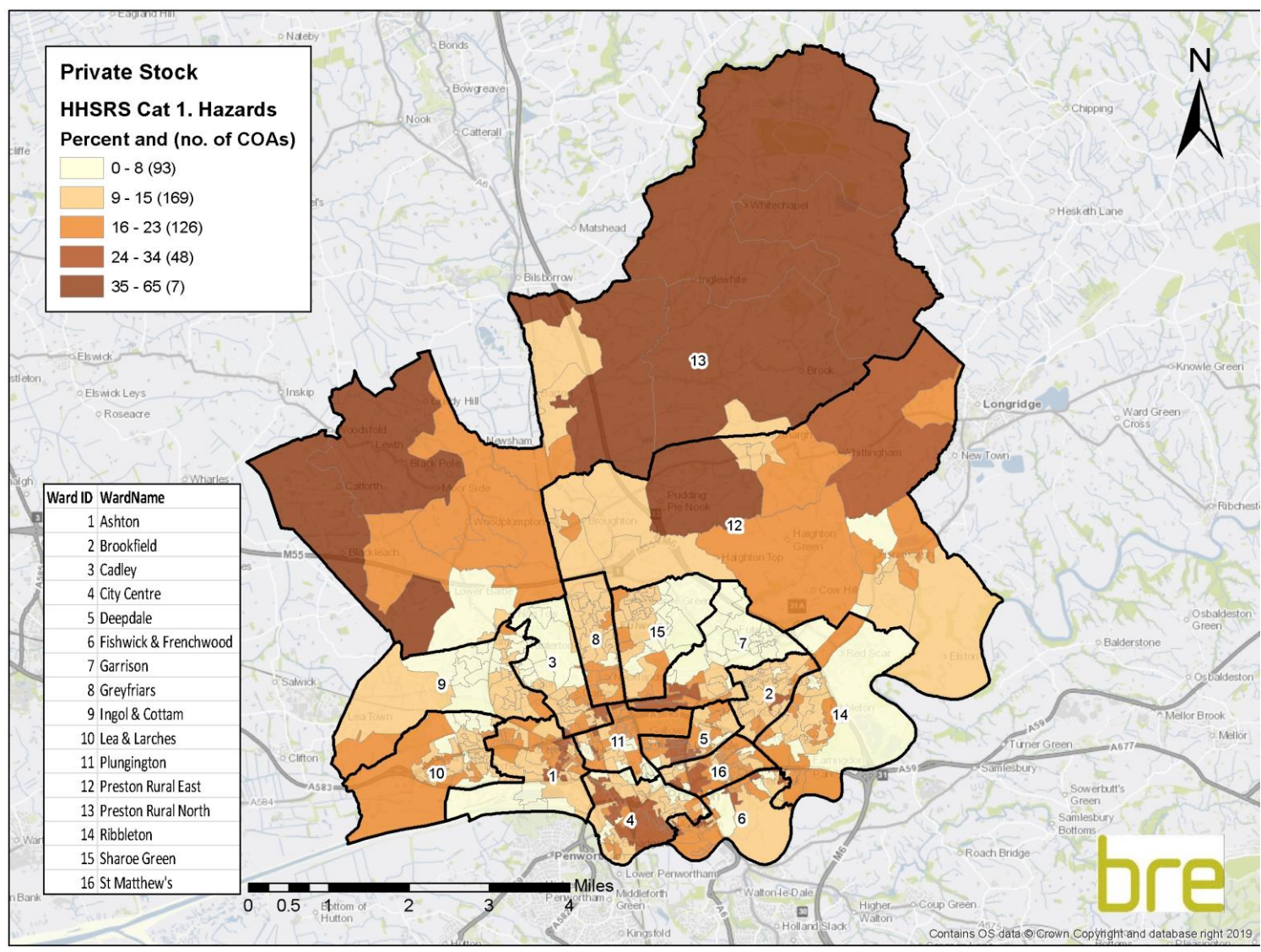
Looking at the hazard of excess cold, there are higher levels in the more rural areas towards the north – see **Map 5**. The data behind the map shows that the highest levels overall are in Preston Rural North, Preston Rural East and St Matthew's. Preston Rural North ward has particularly high levels of excess cold which may be due to it being a rural area with less properties on the gas network and larger, detached properties which can be harder to heat. **Map D. 2** provides more details for the urban area of Preston.

The distribution of fall hazards is shown in **Map 6** which indicates that the higher concentrations are scattered across the district, with some of the highest levels found across southern areas in and around the city of Preston. The data behind this shows that the wards with the highest levels of fall hazards are Deepdale, Ashton and Fishwick & Frenchwood, with Plungington and St. Matthew's also having higher levels. **Map D.3** zooms in on the city of Preston and shows that some of the highest levels are to the north of Ashton ward, to the south and west of Deepdale ward and across the west of Fishwick & Frenchwood ward.

⁴³ Housing Health and Safety Rating System Operating Guidance, ODPM, 2006

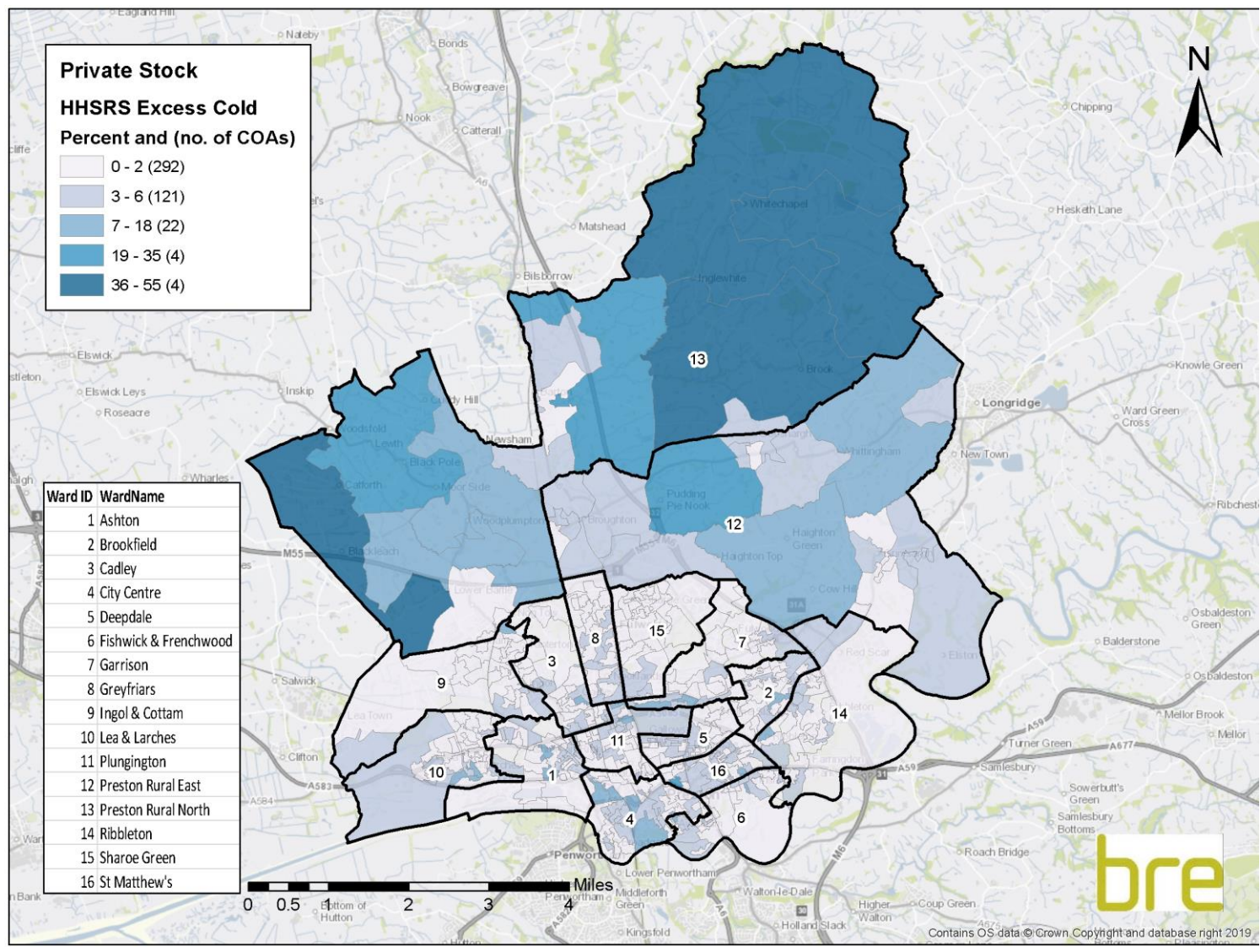


Map 4: Percentage of private sector dwellings in Preston with the presence of a HHSRS category 1 hazard



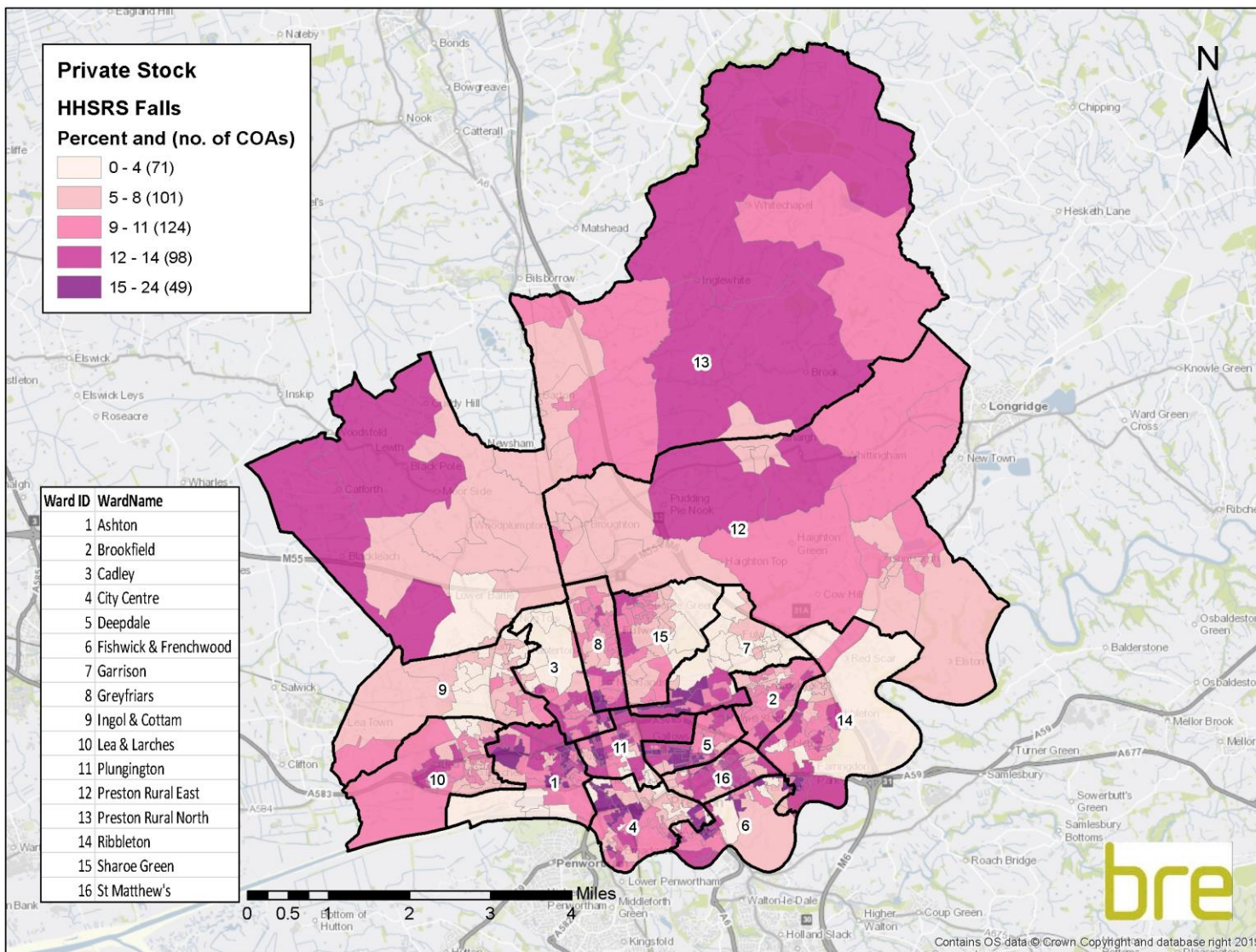


Map 5: Percentage of private sector dwellings in Preston with the presence of a HHSRS category 1 hazard for excess cold





Map 6: Percentage of private sector dwellings in Preston with the presence of a HHSRS category 1 hazard for falls





4.2.3.2 Disrepair

The disrepair variable used in this report is based on the disrepair component of the Decent Homes Standard^{44,45}. A dwelling fails the disrepair component if:

- One or more key building components are old and, because of their condition, need replacing or major repair; or
- Two or more other building components are old and, because of their condition, need replacement or major repair.

Key building components are those which, if in poor condition, could have an immediate impact on the integrity of the building and cause further deterioration in other components. They are the external components plus internal components that have potential safety implications and include:

- External walls
- Roof structure and covering
- Windows/doors
- Chimneys
- Central heating boilers
- Electrics

If any of these components are old, and need replacing or require major repair, then the dwelling is not in a reasonable state of repair.

Other building components are those that have a less immediate impact on the integrity of the dwelling. Their combined effect is therefore considered, with a dwelling failing the disrepair standard if two or more elements are old and need replacing or require immediate major repair.

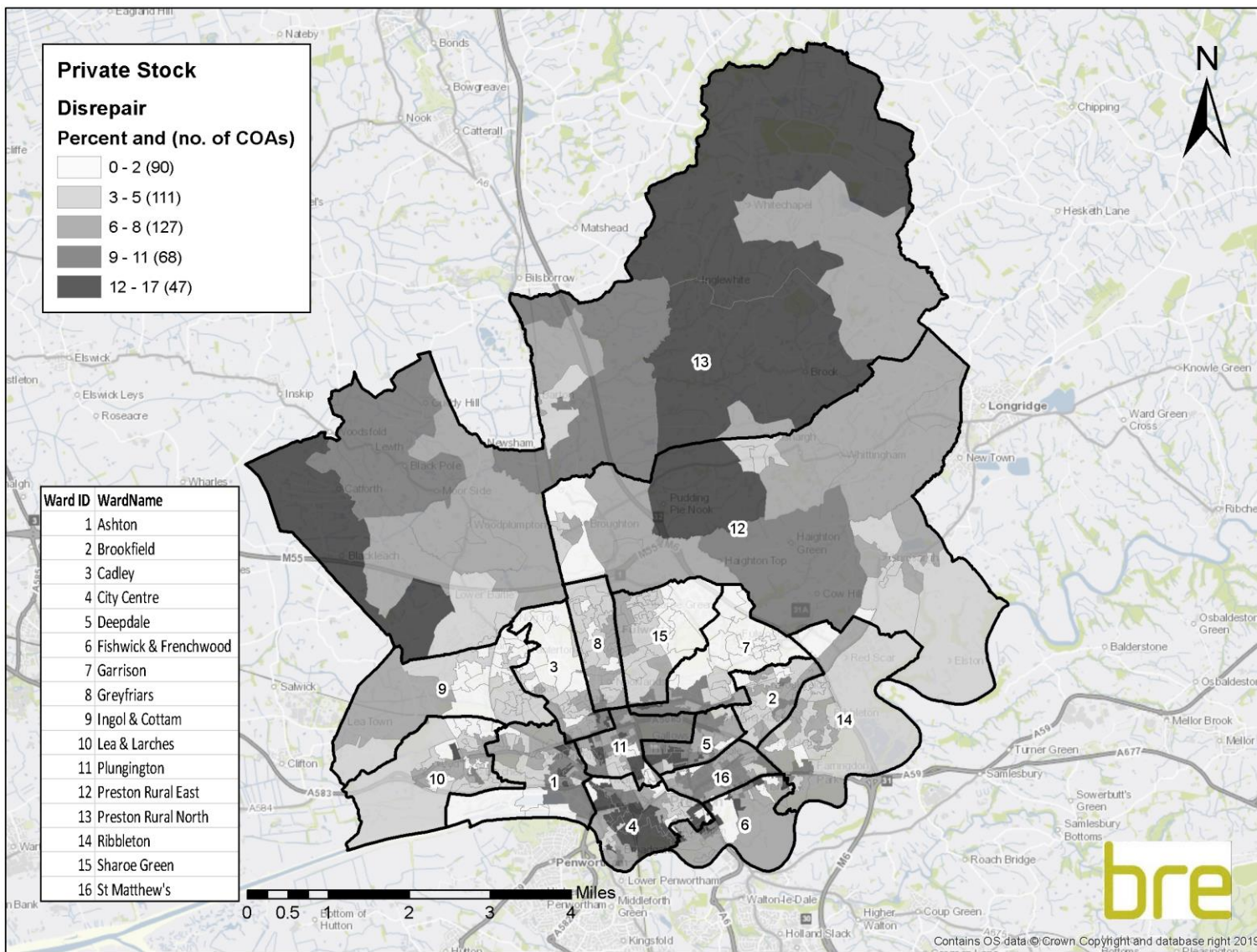
Map 7 shows the distribution of dwellings estimated to be in disrepair in Preston and indicates that there are pockets of higher levels of disrepair across the area, particularly towards the north of the area and in the city of Preston. The data behind the map shows that the highest levels overall are in the wards of Deepdale, City Centre and Fishwick & Frenchwood, with Ashton, Plungington and St. Matthew's also having relatively high levels of disrepair. **Map D.4** zooms in on the city of Preston and shows that the highest levels of disrepair are seen in central and southern parts of City Centre ward, and to the west of Deepdale ward. There are COAs with high concentrations of disrepair elsewhere, for example to the north of Preston Rural East ward and across the north of Fishwick & Frenchwood ward.

⁴⁴ <https://www.gov.uk/government/publications/a-decent-home-definition-and-guidance>

⁴⁵ There are 4 components to the Decent Homes Standard – HHSRS, disrepair, modernisation and thermal comfort



Map 7: Percentage of private sector dwellings in Preston in disrepair



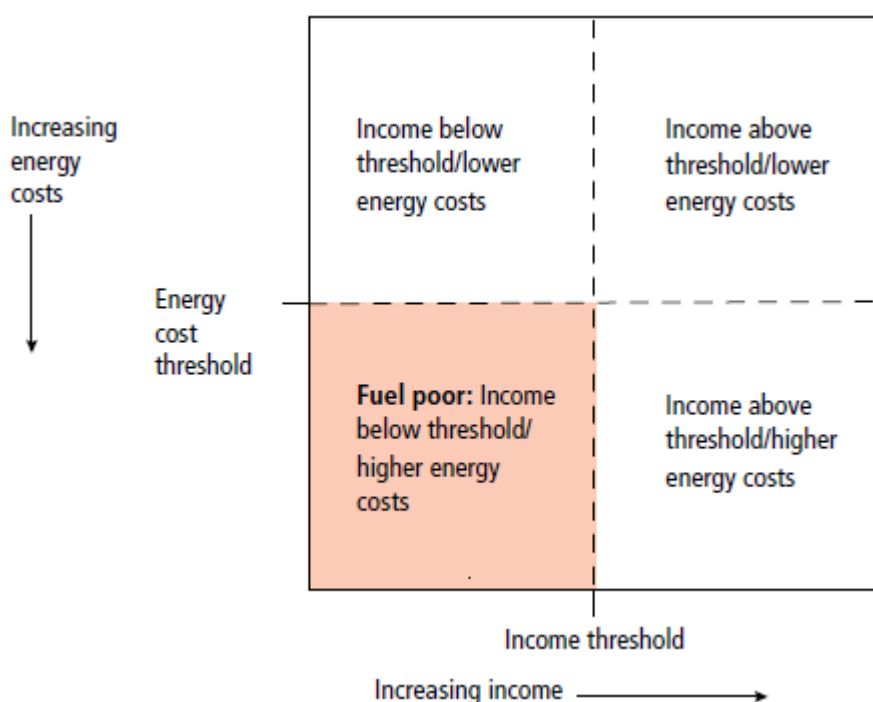


4.2.3.3 Fuel poverty

The current fuel poverty definition is known as the LIHC variable. This is a dual variable which firstly provides an indication of the number of households in fuel poverty and secondly an indication of the cost (in £) to remove households from fuel poverty – this cost is referred to as the Fuel Poverty Gap⁴⁶.

A household is said to be in fuel poverty if they have required fuel costs that are above average (the national median level) and were they to spend that amount they would be left with a residual income below the official poverty line (see the shaded area in **Figure 7** below). For the purposes of this report this is termed “fuel poverty (LIHC)”.

Figure 7: A representation of the Low Income High Costs definition of fuel poverty⁴⁷



As the LIHC fuel poverty variable is a relative measure, it provides a steady trend in the number of fuel poor households over time. A change in income will only have an impact on fuel poverty if households with low incomes and high costs see relatively larger income changes (increases or decreases) than the overall average change in income.

In contrast, the fuel poverty gap is more responsive to changes in energy prices and the economy, therefore providing a clearer measure of the depth of fuel poverty among those fuel poor households. This measure is therefore more useful for identifying trends in fuel poverty over time.

⁴⁶ DECC, Annual Fuel Poverty Statistics Report, 2016 – England (National Statistics), 20 June 2016

⁴⁷ Hills J, Getting the measure of fuel poverty – Final Report of the Fuel Poverty Review, London: LSE, 2012



Map 8 shows that, based on the LIHC definition, there are areas of higher concentrations towards the south and the north of the area. The wards with the highest concentrations overall are Ribbleton, Preston Rural North and City Centre. **Map D.5** focuses in on the city of Preston. The highest concentrations of fuel poverty in Ribbleton are in west and southern parts of the ward. In Preston Rural North ward, the highest concentrations are to the centre, east and north; and in City Centre ward, higher concentrations are seen to the east.

The national indicators for the fuel poverty gap are expressed as the average fuel poverty gap, which is the average amount of money required to lift a fuel poor household out of fuel poverty (£321 in England in 2017). The aggregated fuel poverty gap – i.e. the total amount of money required to lift *all* fuel poor households out of fuel poverty in England is £812 million (in 2017).

Figure 8 provides the national average fuel poverty gap figures by SAP band for private sector stock. By using the bandings based on the SimpleSAP model it is possible to estimate the aggregated fuel poverty gap within each band for the fuel poor households in Preston. **Figure 9** provides the estimates for the private rented sector. The estimated aggregated fuel poverty gap for fuel poor households in the private sector in Preston is £2.24 million, of which £0.69 million is from the private rented sector.

The 251 private rented households living in dwellings with a SimpleSAP rating of F or G would require increases in income totalling £259,534 per year to lift them out of fuel poverty.

Figure 8: Aggregated fuel poverty gap figures for the private sector stock in Preston by SAP band

	Avg fuel poverty gap (England 2017)	Preston	
		Fuel poor households	Aggregated fuel poverty gap
		Count	£
(92-100) A			
(81-91) B	168	203	34,158
(69-80) C			
(55-68) D	223	2928	654,135
(39-54) E	421	1660	698,499
(21-38) F			
(1-20) G	1,056	809	854,504



Figure 9: Aggregated fuel poverty gap figures for the private rented sector stock in Preston by SAP band

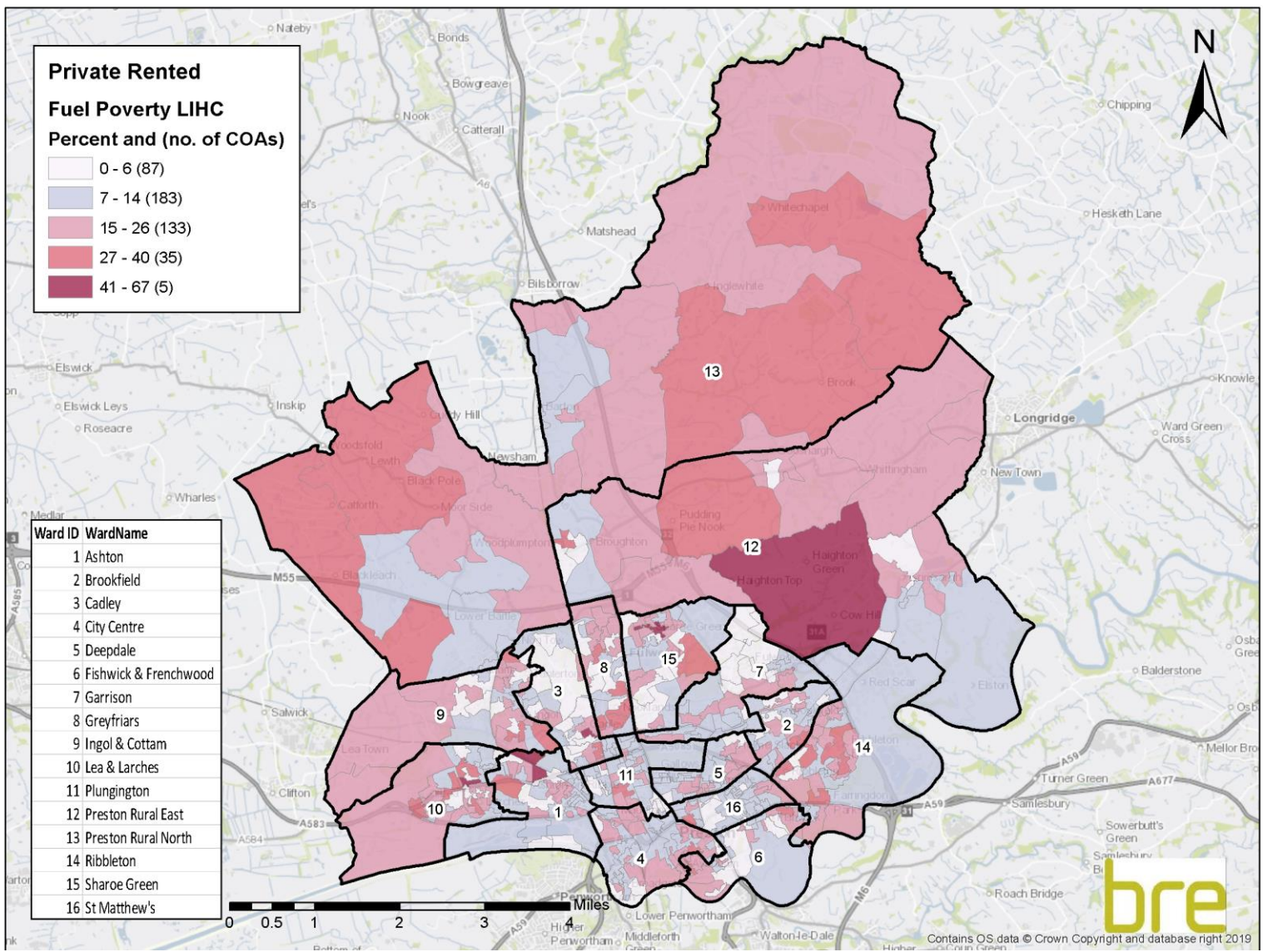
	Avg fuel poverty gap (England 2017)	Preston	
		Fuel poor households	Aggregated fuel poverty gap
		Count	£
(92-100) A			
(81-91) B	97	144	13,968
(69-80) C			
(55-68) D	203	1030	209,090
(39-54) E	339	604	204,756
(21-38) F			
(1-20) G	1,034	251	259,534

For completeness of information, and comparison with previous data, this report also includes an analysis of fuel poverty using the original definition. This states that a household is said to be in fuel poverty if it spends more than 10% of its income on fuel to maintain an adequate level of warmth (defined as 21°C for the main living area, and 18°C for other occupied rooms in the 2012 Hills Fuel Poverty Review⁴⁷). For the purposes of this report this is referred to as “fuel poverty (10% definition)”.

Map 9 and **Map D.6** show the distribution of households in fuel poverty using the 10% definition. There is a similar pattern to the distribution of fuel poverty using the LIHC definition.

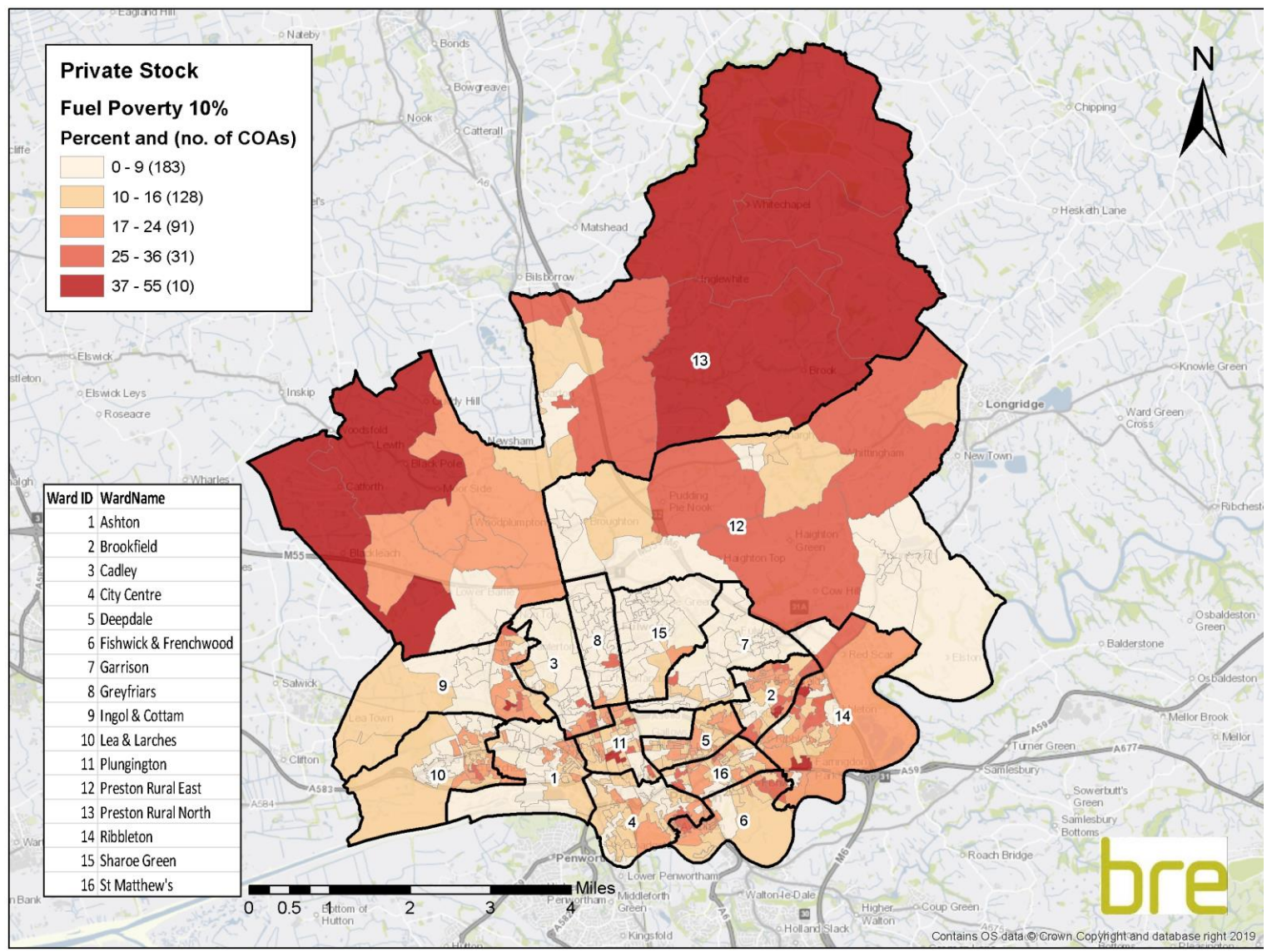


Map 8: Percentage of private sector dwellings in Preston occupied by households in fuel poverty - LIHC definition





Map 9: Percentage of private sector dwellings in Preston occupied by households in fuel poverty – 10% definition





4.2.3.4 Low income households

A low income household is defined as a household in receipt of:

- Means tested benefits or tax credits with a relevant income below the threshold of £16,105
- Attendance allowance
- Disability living allowance
- Personal Independence Payment
- Industrial injuries disablement benefit
- War disablement pension
- Income support or income based Job Seekers Allowance/incapacity benefit that included an income support component
- income based Employment and Support Allowance
- Universal Credit
- Housing related benefits that help pay towards rent
- Any household on a low income that has had their income imputed up to their basic income support entitlement
- Pension credit
- Child tax credit
- Working tax credit

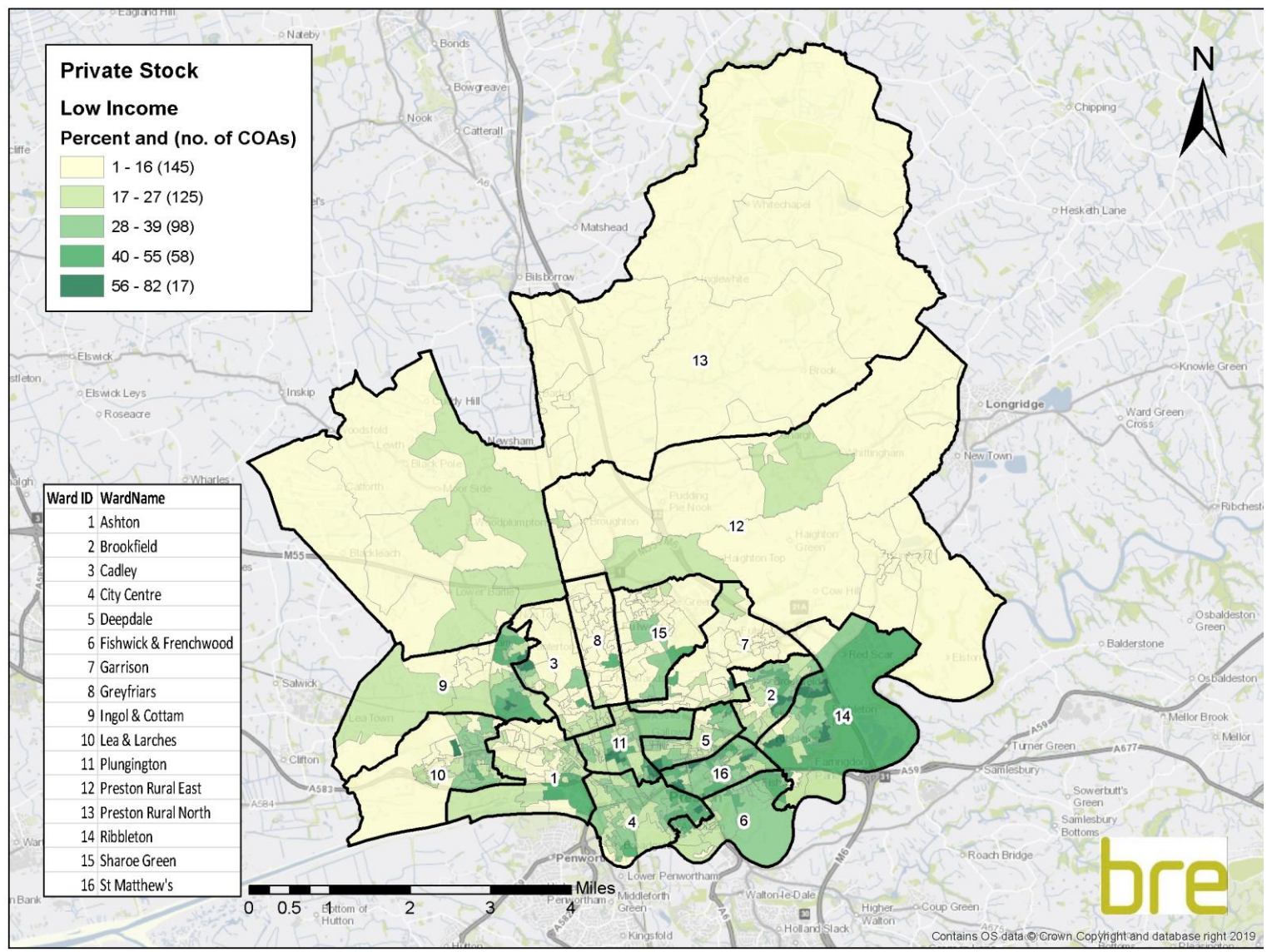
For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £16,105.

Map 10 clearly shows that concentrations of low income households are clustered around the south of the area and the City of Preston. The highest levels overall are found in St Matthew's, Ribbleton and Fishwick & Frenchwood. However, there are other areas which also have high concentrations of low income households; for example, parts of City Centre ward and the south of Plungington ward. **Map D. 7** provides more detail for the urban area showing, for example, that in St Matthew's the highest levels are scattered across the ward and in Ribbleton the highest levels are concentrated in COAs in western parts of the ward.

Map 11 provides an additional layer of information, with the data for low income households being combined with HHSRS excess cold data. This provides a vital picture of where vulnerable people are likely to be living in poor housing. The map indicates that there are pockets of both low income and excess cold mainly towards the rural areas in the north. **Map D.8** zooms in to provide more detail for the urban area in the south.

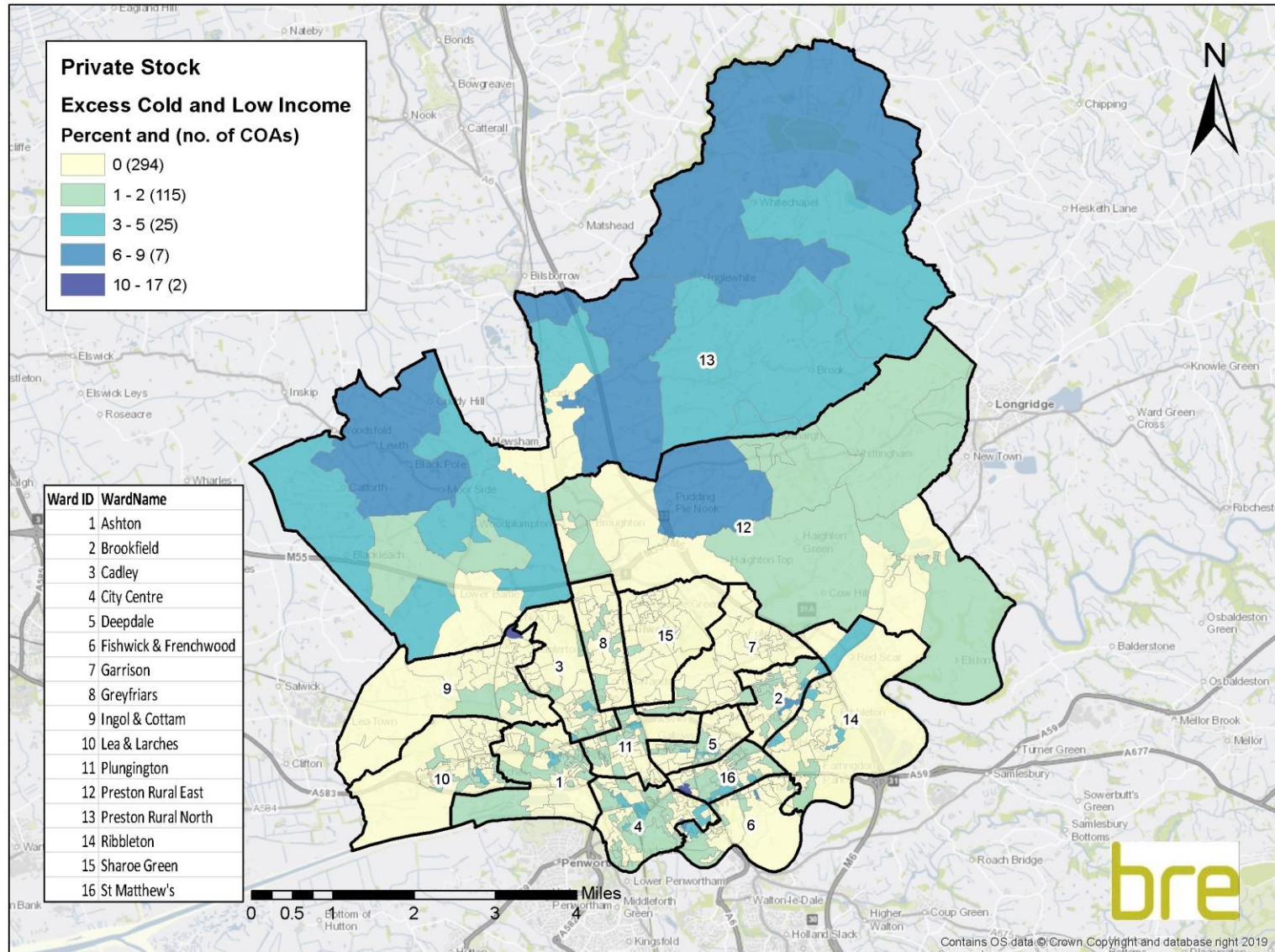


Map 10: Percentage of private sector dwellings in Preston occupied by low income households





Map 11: Percentage of private sector dwellings in Preston with both the presence of a HHSRS category 1 hazard for excess cold and occupied by low income households





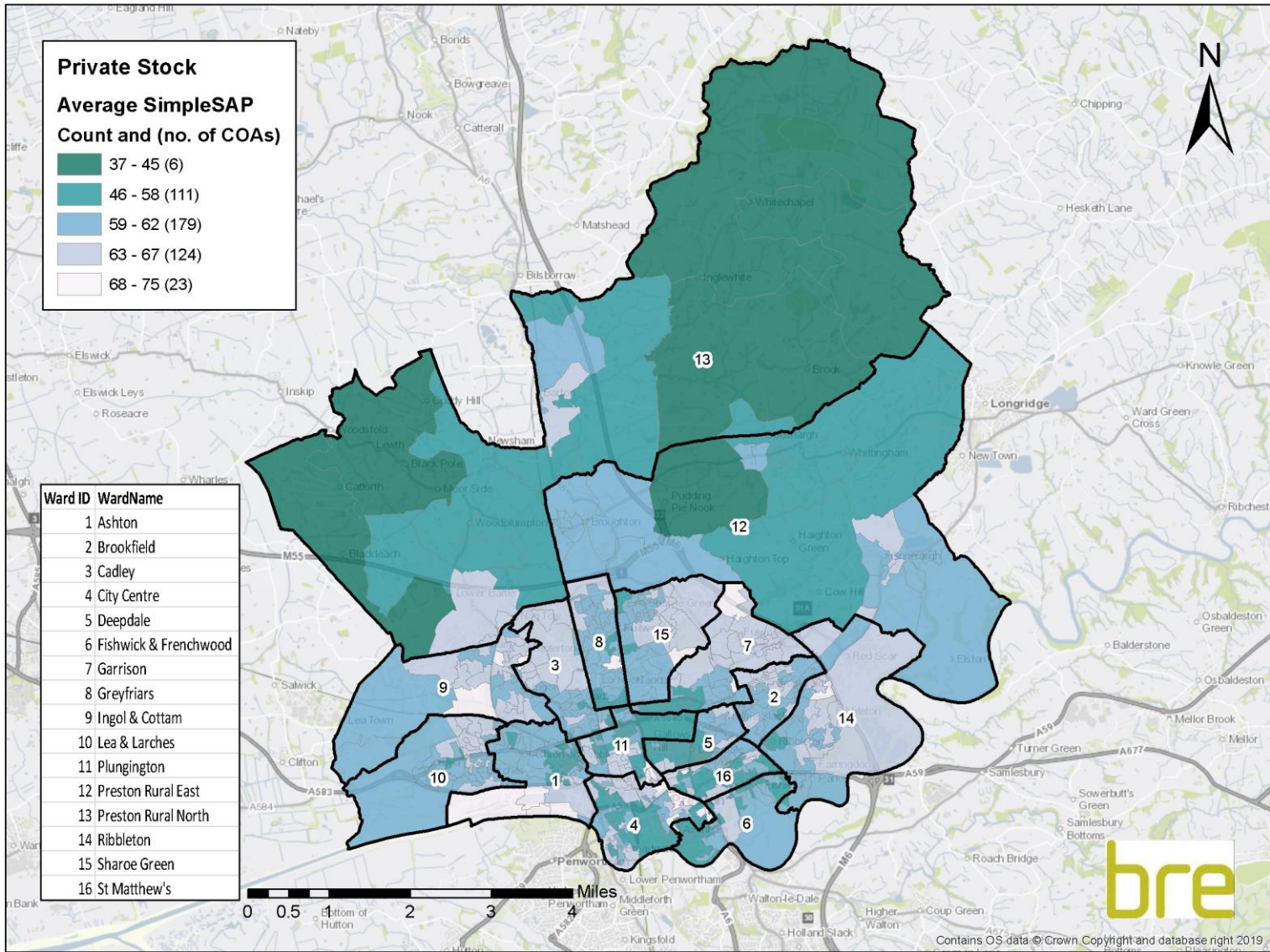
4.2.3.5 SimpleSAP

The average SimpleSAP map (**Map 12**) shows that areas with lower average SimpleSAP ratings are clustered throughout the area. The data behind the map shows that the wards with the lowest average SimpleSAP ratings are Preston Rural North, Deepdale and Fishwick & Frenchwood. **Map D.9** provides more details for the south of Preston.

Lower SimpleSAP ratings can occur in areas with larger, older homes where little work has been done by the occupiers to improve energy performance. The size of the home itself is not a factor in SimpleSAP, but these homes are more likely to be semi-detached or detached, and therefore have larger heat loss areas.



Map 12: Average SimpleSAP ratings per dwelling in Preston private sector stock





4.2.4 Ward level results for the Housing Standards Variables

The previous maps have provided a visual representation of the Housing Standards Variables at Census Output Area (COA) level. The following tables provide the complete set of figures at ward level for each of the variables; firstly, for the total stock (**Table 5**) and secondly, for the private sector stock (**Table 6**), owner occupied sector stock (**Table 7**) and private rented sector stock (**Table 8**). This allows a direct comparison between the wards in Preston.

Table 5: Total stock – number and percentage of dwellings for each of the Housing Standards Variables, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Ashton	4,366	730 (17%)	93 (2%)	510 (12%)	325 (7%)	461 (11%)	465 (11%)	869 (20%)	61
Brookfield	3,497	384 (11%)	44 (1%)	278 (8%)	136 (4%)	455 (13%)	456 (13%)	1,467 (42%)	63
Cadley	3,740	451 (12%)	61 (2%)	312 (8%)	170 (5%)	347 (9%)	353 (9%)	883 (24%)	62
City Centre	5,650	942 (17%)	158 (3%)	487 (9%)	452 (8%)	646 (11%)	720 (13%)	2,025 (36%)	62
Deepdale	3,588	673 (19%)	83 (2%)	440 (12%)	320 (9%)	524 (15%)	409 (11%)	1,191 (33%)	58
Fishwick & Frenchwood	3,811	616 (16%)	93 (2%)	367 (10%)	255 (7%)	633 (17%)	507 (13%)	1,566 (41%)	60
Garrison	3,695	447 (12%)	67 (2%)	291 (8%)	145 (4%)	214 (6%)	309 (8%)	670 (18%)	63
Greyfriars	3,390	475 (14%)	61 (2%)	335 (10%)	174 (5%)	189 (6%)	276 (8%)	382 (11%)	61
Ingol & Cottam	4,125	289 (7%)	34 (1%)	203 (5%)	80 (2%)	385 (9%)	419 (10%)	1,536 (37%)	65
Lea & Larches	4,089	398 (10%)	69 (2%)	280 (7%)	132 (3%)	488 (12%)	496 (12%)	1,465 (36%)	63
Plungington	4,664	658 (14%)	116 (2%)	434 (9%)	315 (7%)	617 (13%)	540 (12%)	1,649 (35%)	61
Preston Rural East	3,085	445 (14%)	142 (5%)	254 (8%)	165 (5%)	291 (9%)	305 (10%)	402 (13%)	59
Preston Rural North	2,116	593 (28%)	419 (20%)	180 (9%)	154 (7%)	515 (24%)	301 (14%)	277 (13%)	54
Ribbleton	3,723	365 (10%)	49 (1%)	272 (7%)	122 (3%)	563 (15%)	524 (14%)	2,007 (54%)	64
Sharoe Green	3,655	380 (10%)	26 (1%)	285 (8%)	127 (3%)	182 (5%)	273 (7%)	637 (17%)	63
St Matthew's	4,431	594 (13%)	124 (3%)	367 (8%)	260 (6%)	618 (14%)	492 (11%)	2,149 (48%)	62

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under ‘all hazards’. The number of dwellings under ‘all hazards’ can therefore be less than the sum of the excess cold plus fall hazards.



Table 6: Private sector stock – number and percentage of dwellings for each of the Housing Standards Variables, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Ashton	4,232	723 (17%)	93 (2%)	503 (12%)	323 (8%)	449 (11%)	451 (11%)	768 (18%)	60
Brookfield	2,261	306 (14%)	37 (2%)	216 (10%)	118 (5%)	337 (15%)	304 (13%)	568 (25%)	62
Cadley	3,318	433 (13%)	56 (2%)	299 (9%)	165 (5%)	311 (9%)	316 (10%)	585 (18%)	62
City Centre	4,702	883 (19%)	142 (3%)	451 (10%)	440 (9%)	540 (11%)	635 (14%)	1,341 (29%)	61
Deepdale	2,983	633 (21%)	77 (3%)	409 (14%)	311 (10%)	468 (16%)	344 (12%)	789 (26%)	57
Fishwick & Frenchwood	2,871	549 (19%)	82 (3%)	318 (11%)	241 (8%)	508 (18%)	375 (13%)	887 (31%)	59
Garrison	3,427	439 (13%)	64 (2%)	286 (8%)	144 (4%)	188 (5%)	289 (8%)	463 (14%)	62
Greyfriars	3,308	471 (14%)	60 (2%)	333 (10%)	173 (5%)	181 (5%)	272 (8%)	322 (10%)	61
Ingol & Cottam	2,806	236 (8%)	32 (1%)	160 (6%)	72 (3%)	248 (9%)	291 (10%)	576 (21%)	64
Lea & Larches	3,058	336 (11%)	56 (2%)	235 (8%)	117 (4%)	363 (12%)	362 (12%)	746 (24%)	62
Plungington	3,845	620 (16%)	110 (3%)	405 (11%)	308 (8%)	543 (14%)	480 (12%)	1,084 (28%)	60
Preston Rural East	3,013	440 (15%)	142 (5%)	250 (8%)	164 (5%)	287 (10%)	296 (10%)	358 (12%)	59
Preston Rural North	2,073	586 (28%)	415 (20%)	178 (9%)	153 (7%)	511 (25%)	296 (14%)	256 (12%)	53
Ribbleton	1,860	253 (14%)	36 (2%)	183 (10%)	98 (5%)	360 (19%)	286 (15%)	636 (34%)	62
Sharoe Green	3,418	375 (11%)	26 (1%)	281 (8%)	126 (4%)	166 (5%)	262 (8%)	489 (14%)	62
St Matthew's	2,926	510 (17%)	108 (4%)	308 (11%)	238 (8%)	431 (15%)	341 (12%)	1,004 (34%)	60

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under ‘all hazards’. The number of dwellings under ‘all hazards’ can therefore be less than the sum of the excess cold plus fall hazards.



Table 7: Owner occupied sector stock – number and percentage of dwellings for each of the Housing Standards Variables, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Ashton	2,850	485 (17%)	67 (2%)	352 (12%)	204 (7%)	332 (12%)	300 (11%)	433 (15%)	60
Brookfield	1,914	256 (13%)	31 (2%)	184 (10%)	97 (5%)	295 (15%)	258 (13%)	434 (23%)	62
Cadley	2,694	326 (12%)	38 (1%)	240 (9%)	118 (4%)	248 (9%)	240 (9%)	418 (16%)	62
City Centre	1,306	229 (18%)	32 (2%)	141 (11%)	99 (8%)	202 (15%)	152 (12%)	271 (21%)	61
Deepdale	1,922	413 (21%)	52 (3%)	262 (14%)	190 (10%)	367 (19%)	220 (11%)	471 (25%)	57
Fishwick & Frenchwood	1,691	347 (21%)	36 (2%)	218 (13%)	150 (9%)	329 (19%)	209 (12%)	432 (26%)	58
Garrison	2,942	364 (12%)	59 (2%)	238 (8%)	109 (4%)	156 (5%)	240 (8%)	322 (11%)	62
Greyfriars	3,018	422 (14%)	55 (2%)	302 (10%)	153 (5%)	155 (5%)	225 (7%)	267 (9%)	61
Ingol & Cottam	2,143	175 (8%)	29 (1%)	121 (6%)	44 (2%)	161 (8%)	178 (8%)	337 (16%)	64
Lea & Larches	2,466	272 (11%)	40 (2%)	199 (8%)	95 (4%)	301 (12%)	271 (11%)	550 (22%)	62
Plungington	1,690	290 (17%)	55 (3%)	191 (11%)	129 (8%)	366 (22%)	253 (15%)	421 (25%)	59
Preston Rural East	2,539	376 (15%)	130 (5%)	212 (8%)	134 (5%)	241 (9%)	213 (8%)	244 (10%)	59
Preston Rural North	1,724	530 (31%)	385 (22%)	158 (9%)	134 (8%)	460 (27%)	235 (14%)	169 (10%)	51
Ribbleton	1,379	197 (14%)	22 (2%)	149 (11%)	74 (5%)	258 (19%)	193 (14%)	397 (29%)	61
Sharoe Green	3,000	326 (11%)	23 (1%)	245 (8%)	110 (4%)	136 (5%)	205 (7%)	379 (13%)	62
St Matthew's	1,478	273 (18%)	54 (4%)	168 (11%)	119 (8%)	282 (19%)	179 (12%)	455 (31%)	59

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under 'all hazards'. The number of dwellings under 'all hazards' can therefore be less than the sum of the excess cold plus fall hazards.



Table 8: Private rented sector stock – number and percentage of dwellings for each of the Housing Standards Variables, and average SimpleSAP ratings by ward

Ward	Dwellings	HHSRS category 1 hazards			Disrepair	Fuel poverty		Low income households	Average SimpleSAP
		All hazards	Excess cold	Fall hazards		10%	LIHC		
Ashton	1,382	238 (17%)	26 (2%)	151 (11%)	119 (9%)	117 (8%)	151 (11%)	335 (24%)	62
Brookfield	347	50 (14%)	6 (2%)	32 (9%)	21 (6%)	42 (12%)	46 (13%)	134 (39%)	63
Cadley	624	107 (17%)	18 (3%)	59 (9%)	47 (8%)	63 (10%)	76 (12%)	167 (27%)	61
City Centre	3,396	654 (19%)	110 (3%)	310 (9%)	341 (10%)	338 (10%)	483 (14%)	1,070 (32%)	61
Deepdale	1,061	220 (21%)	25 (2%)	147 (14%)	121 (11%)	101 (10%)	124 (12%)	318 (30%)	58
Fishwick & Frenchwood	1,180	202 (17%)	46 (4%)	100 (8%)	91 (8%)	179 (15%)	166 (14%)	455 (39%)	59
Garrison	485	75 (15%)	5 (1%)	48 (10%)	35 (7%)	32 (7%)	49 (10%)	141 (29%)	63
Greyfriars	290	49 (17%)	5 (2%)	31 (11%)	20 (7%)	26 (9%)	47 (16%)	55 (19%)	61
Ingol & Cottam	663	61 (9%)	3 (0%)	39 (6%)	28 (4%)	87 (13%)	113 (17%)	239 (36%)	65
Lea & Larches	592	64 (11%)	16 (3%)	36 (6%)	22 (4%)	62 (10%)	91 (15%)	196 (33%)	63
Plungington	2,155	330 (15%)	55 (3%)	214 (10%)	179 (8%)	177 (8%)	227 (11%)	663 (31%)	60
Preston Rural East	474	64 (14%)	12 (3%)	38 (8%)	30 (6%)	46 (10%)	83 (18%)	114 (24%)	62
Preston Rural North	349	56 (16%)	30 (9%)	20 (6%)	19 (5%)	51 (15%)	61 (17%)	87 (25%)	63
Ribbleton	481	56 (12%)	14 (3%)	34 (7%)	24 (5%)	102 (21%)	93 (19%)	239 (50%)	63
Sharoe Green	418	49 (12%)	3 (1%)	36 (9%)	16 (4%)	30 (7%)	57 (14%)	110 (26%)	63
St Matthew's	1,448	237 (16%)	54 (4%)	140 (10%)	119 (8%)	149 (10%)	162 (11%)	549 (38%)	61

N.B. the information on hazards refers to the number of dwellings with a hazard of the stated type. Because of this there is likely to be some overlap – for example, some dwellings are likely to have excess cold and fall hazards but this dwelling would only be represented once under ‘all hazards’. The number of dwellings under ‘all hazards’ can therefore be less than the sum of the excess cold plus fall hazards.



4.3 Information relating to LAHS reporting and EPC ratings

4.3.1 Cost of mitigating category 1 hazards in the Preston private sector stock

Table 9 shows the total number of dwellings with HHSRS category 1 hazards in Preston's private sector stock, the average cost of mitigating hazards per dwelling and the total cost for mitigating all hazards within those dwellings. The costs are based on the average cost of mitigating category 1 hazards for the region using EHS 2015 data. The EHS costs are determined following a surveyor's assessment of the hazard. For each hazard the surveyor is given a range of common treatments that they can specify in order to treat the hazard. Where quantities are required the surveyor may specify them. The treatment recommended by the surveyor is then costed using a standard set of prices.

Table 9: Estimated costs to mitigate all category 1 hazards in private sector stock, split into tenure

Tenure	No. of hazards	Total cost (£)
Private Sector	7,793	17,557,456
Owner occupied	5,281	11,897,976
Private rented	2,512	5,659,480

4.3.2 Houses in Multiple Occupation (HMOs) in the Preston private sector stock

The Housing Act 2004 introduced a new set of definitions for HMOs in England from 6 April 2006⁴⁸. The definition is a complex one and the bullet points below, which are adapted from web pages provided by the National HMO Network⁴⁹, provide a summary:

- An entire house or flat which is let to 3 or more tenants who form 2 or more households and who share a kitchen, bathroom or toilet
- A house which has been converted entirely into bedsits or other non-self-contained accommodation and which is let to 3 or more tenants who form two or more households and who share kitchen, bathroom or toilet facilities
- A converted house which contains one or more flats which are not wholly self-contained (i.e. the flat does not contain within it a kitchen, bathroom and toilet) and which is occupied by 3 or more tenants who form two or more households
- A building which is converted entirely into self-contained flats if the conversion did not meet the standards of the 1991 Building Regulations and more than one-third of the flats are let on short-term tenancies

The recently published "Houses in Multiple Occupation and residential property licensing reform"⁵⁰ provides guidance to local authorities on changes to rules on licensing HMOs. From 1 October 2018, mandatory

⁴⁸ See Sections 254-258 of the Housing Act (<http://www.legislation.gov.uk/ukpga/2004/34/contents>)

⁴⁹ National HMO Network <http://www.nationalhmonetwork.com/definition.php>



licensing of HMOs was extended to cover all relevant HMOs regardless of the number of storeys (compared to the previous definition which limited this to buildings of 3 or more storeys). Purpose built flats will only require a licence where there are fewer than 3 flats in the block. The requirement for the HMO to be occupied by five or more persons in two or more households will remain⁵¹. From 1 October 2018, the extension came into effect and those dwellings that fall under the new definition will require a licence.

To be classified as an HMO the property must be used as the tenants' only or main residence and it should be used solely or mainly to house tenants. Properties let to students and migrant workers will be treated as their only or main residence and the same will apply to properties which are used as domestic refuges.

The LAHS requires estimates of the number of HMOs and the number of mandatory licensable HMOs.

- Number of private sector HMOs
 - Modelled using specific criteria from a number of Experian data sources and information derived from the SimpleCO₂ model. The criteria include privately rented dwellings with 3 or more bedrooms occupied by male/female/mixed home sharers, mixed occupancy dwellings or classified as the following Experian Mosaic classifications:
 - Renting a room
 - Career Builders
 - Flexible Workforce
 - Bus Route Renters
 - Learners and earners
 - Student scene
- Number of mandatory licensable HMOs under the Government's new definition, as of 1 October 2018
 - This has been modelled using the above criteria for HMOs plus the dwelling must have 4 or more bedrooms. This will apply to both houses and converted flats.
 - Purpose built flats where there are up to two flats in the block and one or both have 4 or more bedrooms.

Table 10 summarises the results for the private sector stock in Preston, while **Map 13** shows the geographic distribution of HMOs and **Map 14** shows the distribution of mandatory licensable HMOs. The maps show the majority of HMOs to be concentrated towards southern parts of the city of Preston where the university and much of the student accommodation is situated. There are notable concentrations in City Centre ward, the centre of Plungington ward, the east of Ribbleton ward and the west of St Matthew's ward. Licensable HMOs are mainly found in and around the City of Preston, mainly in City Centre ward. **Map D. 10** and **Map D. 11** zoom in on the urban area of Preston for HMOs and licensable HMOs, respectively. As previously mentioned, ward level data on HMOs is available in the accompanying Housing Stock Condition Database (HSCD) and **Appendix C** provides guidance on how to use the database.

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/670536/HMO_licensing_reforms_response.pdf

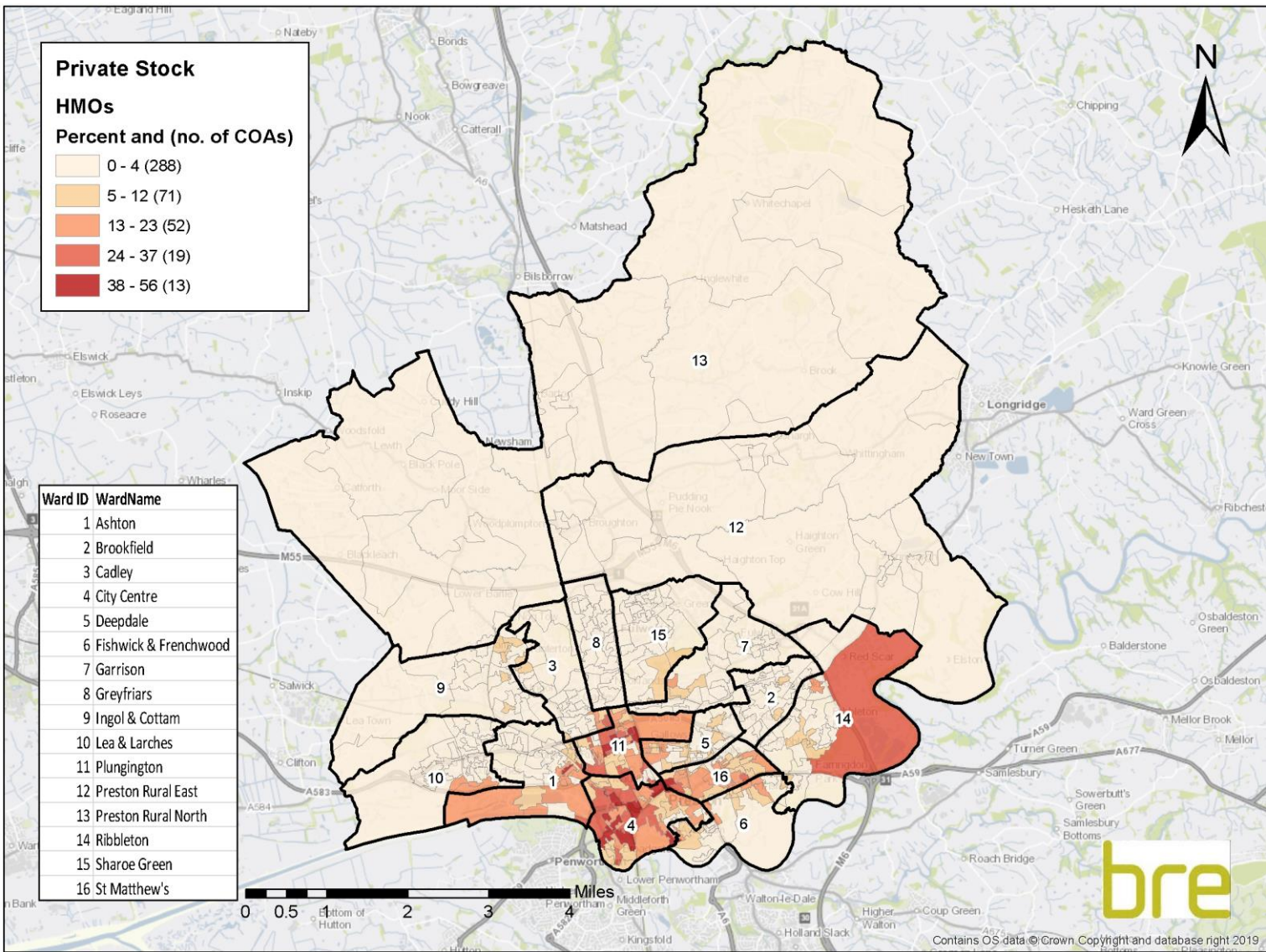
⁵¹ In addition, new mandatory licence conditions will be introduced relating to national minimum sleeping room sizes and provision of waste disposal.

**Table 10:** Summary of HMOs within the Preston private sector stock

Preston	No. of private sector dwellings	HMOs	Mandatory Licensing Scheme HMOs
	50,101	3,471	657

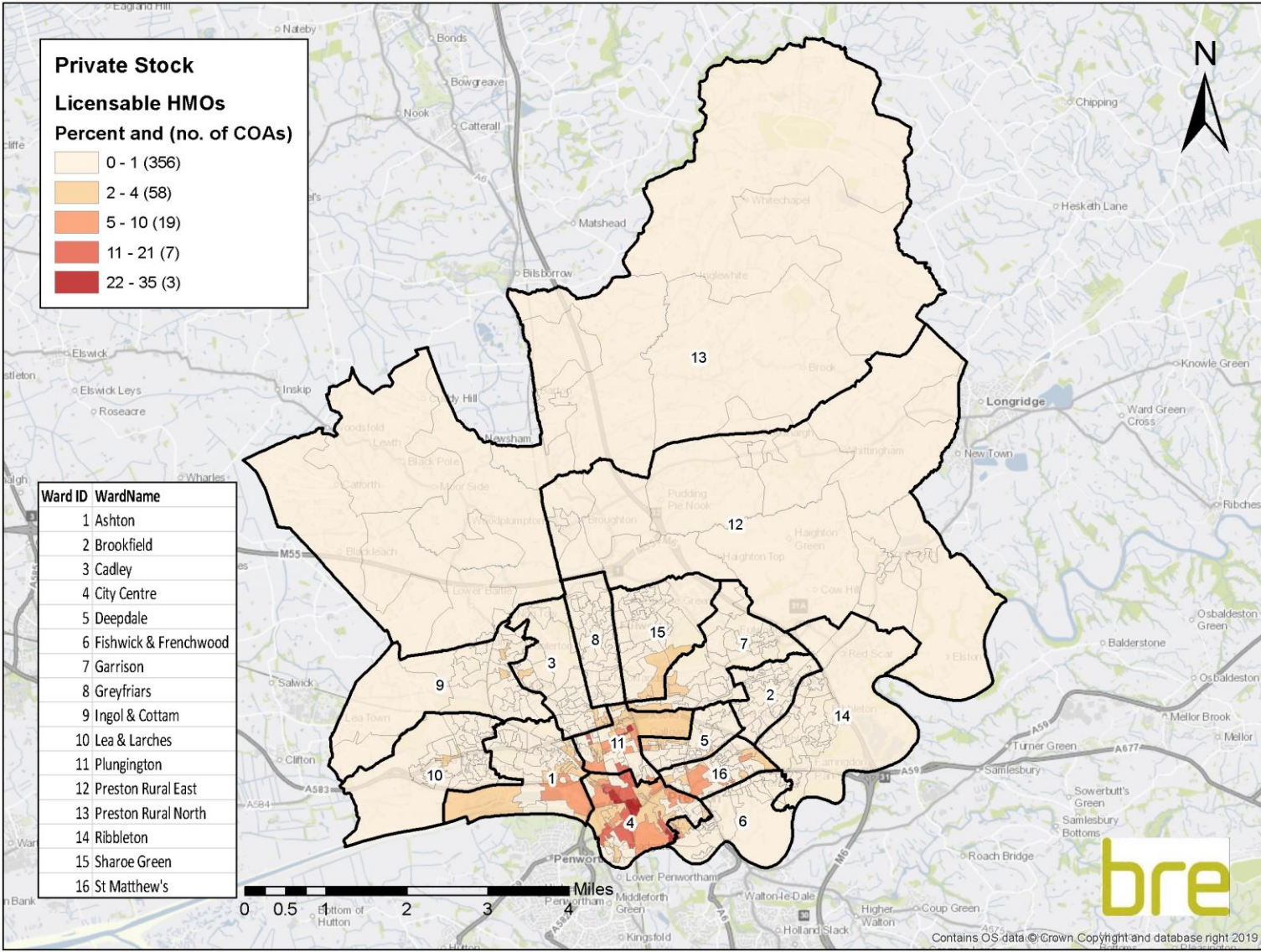


Map 13: Count of HMOs





Map 14: Count of mandatory licensable HMOs





4.3.3 EPC ratings in the Preston private sector stock

An Energy Performance Certificate (EPC) is required whenever a new building is constructed, or an existing building is sold or rented out. An EPC is a measure of the energy efficiency performance of a building and is rated from band A – G, with A representing the best performance. The EPC ratings correspond to a range of SAP ratings from 1 – 100, with 100 being the best. It is possible, therefore, to give a dwelling an EPC rating based on the SAP rating.

Figure 10 below shows the bands A – G and corresponding SAP ratings in brackets. The first two columns show the number and percentage of Preston’s private sector stock falling into each of the EPC ratings bands. The third column shows the comparable figures for the private sector stock in England.

The estimated average SimpleSAP for the private sector stock in Preston is 61 which corresponds to an EPC rating of D. The number of private sector dwellings with an EPC rating below band E is estimated to be 2,327 (4.6%). Compared to the England figure, Preston has a slightly lower proportion of dwellings in all the bands except band D.

Figure 10: Number and percentage of Preston’s *private sector stock* falling into each of the EPC ratings bands (based on SimpleSAP), compared to England (EHS) figures *N.B. England figures report band A and B together*

	Preston		2015 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	1.1%
(81-91) B	153	0.3%	
(69-80) C	11,447	22.8%	23.2%
(55-68) D	27,759	55.4%	51.9%
(39-54) E	8,415	16.8%	18.5%
(21-38) F	1,817	3.6%	4.3%
(1-20) G	510	1.0%	1.1%



Under the Energy Act 2011, from 1 April 2018 landlords have to ensure that when they grant a tenancy to a new or existing tenant, their properties must meet a minimum energy efficiency standard – this is currently set at band E⁵². From 1 April 2020, landlords can no longer continue letting a property which is already let if it has an EPC rating of F or G⁵³.

Figure 11 shows the breakdown of SimpleSAP results into the A – G bands for the private rented stock only and compared to the figures for this tenure in England as a whole. The number of private rented dwellings in Preston with a rating below band E (i.e. bands F and G), is estimated to be 694 (4.5%). Compared to England, there are a greater proportion of dwellings in band C and D and lower proportions in bands E to G.

The distribution of dwellings with EPC ratings below band E is shown in **Map 15** and a map zooming in on south Preston are provided in **Map D. 12**. These are for the private rented stock only, since this is affected by the new rules on minimum standards. Under the legislation these properties are not be eligible to be rented out under new or renewed tenancies, and existing tenancies from 1 April 2020.

Figure 11: Number and percentage of Preston’s *private rented stock* falling into each of the EPC ratings bands (based on SimpleSAP), compared to England (EHS) figures *N.B. England figures report band A and B together*

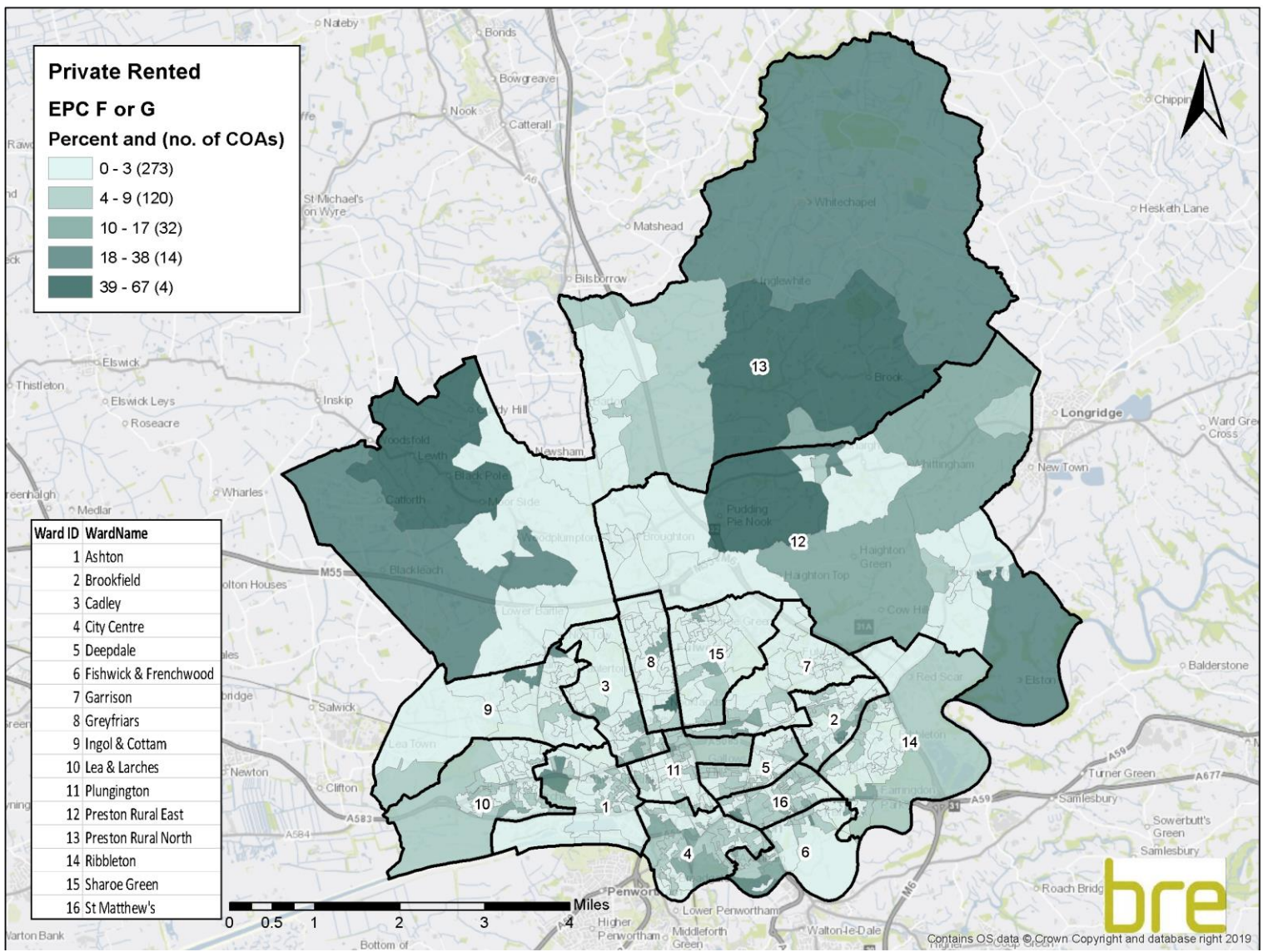
		Preston		2015 EHS England
		Count	Percent	Percent
(92-100)	A	0	0.0%	1.2%
(81-91)	B	98	0.6%	
(69-80)	C	4,205	27.4%	25.3%
(55-68)	D	7,640	49.8%	49.1%
(39-54)	E	2,708	17.6%	18.1%
(21-38)	F	542	3.5%	4.5%
(1-20)	G	152	1.0%	1.8%

⁵² Although landlords will still be able to rent out F and G rated properties after this date they will not be able to renew or sign a new contract.

⁵³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794253/domestic-prs-minimum-standard-guidance.pdf



Map 15: Distribution of dwellings with F or G EPC ratings in the private rented stock





5 Conclusion and recommendations

5.1 Conclusion

Preston City Council commissioned BRE to undertake a series of modelling exercises on their housing stock to provide an integrated housing stock condition database, making use of the EPC data which have been integrated into BRE's standard housing stock condition database. The integration of this data source serves to further increase the accuracy of the models by removing the need to rely on imputed data for the 30,264 cases where EPC data is available, and instead using observed data from the surveys. This leads to more accurate SimpleSAP ratings, more accurate excess cold data (and therefore HHSRS data), and more accurate fuel poverty data for around 49.1% of the stock in Preston.

This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The housing stock condition database is also provided to the council to enable them to obtain specific information whenever required. This database is now in an online format.

The integrated stock models and database provide the council with dwelling level information, focussing on private sector housing, for the following:

- The percentage of dwellings with the presence of each of the Housing Standards Variables for Preston overall and broken down by tenure and then mapped by COA (private sector stock only)
- Information relating to LAHS reporting for the private sector stock - category 1 hazards and HMOs as well as information on EPC ratings

Some of the key findings of this report are as follows:

- The performance of the housing stock in Preston compared to the EHS England average is generally worse, with the exception of excess cold and fuel poverty (LIHC definition) where Preston has similar levels
- The private rented sector is generally worse than the social sector, but similar to the owner occupied sector - with the exception of disrepair, fuel poverty (LIHC definition) and low income households – all of which have higher proportions in the private rented sector.
- 4.5% of dwellings in the private rented sector are estimated to have an EPC below band E. Under the legislation these properties would not be eligible to be rented out to new or renewal tenancies. From 1 April 2020 this will also apply to existing tenancies.

Such information will facilitate the decision making process for targeting resources to improve the condition of housing and to prevent ill health resulting from poor housing conditions. Furthermore, the results of this project provide Preston with information which will assist in housing policy and strategy development whether these are inspired locally, arise from obligations under the Housing Act 2004 or as responses to government initiatives such as MHCLG's Housing Strategy Policy and ECO.

5.2 Recommendations

Programmes designed to tackle disrepair for example group repair schemes, regeneration or enforcement interventions could be considered with a focus on areas of greatest disrepair such as Deepdale ward with 10% disrepair and 21% containing category 1 hazards, or Fishwick & Frenchwood ward with an estimated 8% of private sector homes in disrepair and 19% with category 1 hazards. These



findings could be combined with local intelligence to help identify areas for targeting assistance for physical improvements to private sector stock and the environment. Furthermore, programmes aimed at increasing household income through job creation, benefit entitlement checks and other initiatives should also be considered, with a particular focus on areas containing high proportions of low income households like St Matthew's and Ribbleton (both 34%) and Fishwick & Frenchwood (31%).

The use of additional local data in this project has enhanced the housing stock models and Housing Stock Condition Database (HSCD). The addition of any further local data, were it to become available, would potentially further enhance the models and database.

Examples of such data are:

- **Local Land and Property Gazetteer (LLPG) data**

The Unique Property Reference Number (UPRN) from the LLPG can be used to uniquely identify all properties, while the address details from the LLPG can be used to merge the BRE Models and the EPC data using address matching.

- **Households on benefits**

Data regarding any households in receipt of either Council Tax reduction or Housing Allowance could be used to enhance the low income model, making the targeting of individual low income households more accurate. Such data may also assist in the indentation of households which could benefit from the ECO3 Affordable Warmth scheme.

- **Local repair schemes**

Data from any local repair schemes, including the use of repair grants, could be used to enhance the Disrepair Model.

- **Local energy improvement schemes**

Any local schemes to improve the energy efficiency of dwellings, including national schemes for which local data has been made available to Preston Council, could be used to further enhance the energy models (SimpleSAP, excess cold, fuel poverty).



Appendix A Definitions of the Housing Standards Variables

1. Housing Standards Variables:

a. The presence of a category 1 hazard under the Housing Health and Safety Rating System (HHSRS) – reflecting both condition and thermal efficiency

Homes posing a category 1 hazard under the HHSRS – the system includes 29 hazards in the home categorised into category 1 – band A to C (serious) or category 2 – band D onwards (other) based on a weighted evaluation tool. Note that this includes the hazard of excess cold which is also included as one of the energy efficiency variables.

The 29 hazards are:

1 Damp and mould growth	16 Food safety
2 Excess cold	17 Personal hygiene, Sanitation and Drainage
3 Excess heat	18 Water supply
4 Asbestos	19 Falls associated with baths etc.
5 Biocides	20 Falling on level surfaces etc.
6 Carbon Monoxide and fuel combustion products	21 Falling on stairs etc.
7 Lead	22 Falling between levels
8 Radiation	23 Electrical hazards
9 Uncombusted fuel gas	24 Fire
10 Volatile Organic Compounds	25 Flames, hot surfaces etc.
11 Crowding and space	26 Collision and entrapment
12 Entry by intruders	27 Explosions
13 Lighting	28 Position and operability of amenities etc.
14 Noise	29 Structural collapse and falling elements
15 Domestic hygiene, Pests and Refuse	

b. The presence of a category 1 hazard for falls (includes “falls associated with baths”, “falling on the level” and “falling on stairs”)

The HHSRS Falls Model includes the 3 different falls hazards where the vulnerable person is over 60 as listed above.

c. Dwellings in disrepair (based on the former Decent Homes Standard criteria for Disrepair)

The previous Decent Homes Standard states that a dwelling fails this criterion if it is not found to be in a reasonable state of repair. This is assessed by looking at the age of the dwelling and the condition of a range of building components including walls, roofs, windows, doors, electrics and heating systems).

2. Energy efficiency variables:

a. The presence of a category 1 hazard for excess cold (using SAP ratings as a proxy measure in the same manner as the English House Condition Survey)

This hazard looks at households where there is a threat to health arising from sub-optimal indoor temperatures. The HHSRS assessment is based on the most low income group for this hazard – persons aged 65 years or over (note that the assessment requires the hazard to



be present and potentially affect a person in the low income age group should they occupy that dwelling. The assessment does not take account of the age of the person actually occupying that dwelling at that particular point in time).

The English Housing Survey (EHS) does not measure the actual temperatures achieved in each dwelling and therefore the presence of this hazard is measured by using the SAP rating as a proxy. Dwellings with a SAP rating of less than 33.52 (SAP 2012 methodology) are considered to be suffering from a category 1 excess cold hazard.

b. An estimate of the SAP rating which, to emphasise its origin from a reduced set of input variables, is referred to as “SimpleSAP”

The Standard Assessment Procedure (SAP) is the UK Government’s standard methodology for home energy cost ratings. SAP ratings allow comparisons of energy efficiency to be made, and can show the likely improvements to a dwelling in terms of energy use. The Building Regulations require a SAP assessment to be carried out for all new dwellings and conversions. Local authorities, housing associations, and other landlords also use SAP ratings to estimate the energy efficiency of existing housing. The version on which the Average SAP rating model is based is SAP 2012.

The SAP ratings give a measure of the annual unit energy cost of space and water heating for the dwelling under a standard regime, assuming specific heating patterns and room temperatures. The fuel prices used are the same as those specified in SAP 2012. The SAP takes into account a range of factors that contribute to energy efficiency, which include:

- Thermal insulation of the building fabric
- The shape and exposed surfaces of the dwelling
- Efficiency and control of the heating system
- The fuel used for space and water heating
- Ventilation and solar gain characteristics of the dwelling

3. Household vulnerability variables:

a. Fuel poverty - 10% definition

This definition states that a household is said to be in fuel poverty if it spends more than 10% of its income on fuel to maintain an adequate level of warmth (usually defined as 21°C for the main living area, and 18°C for other occupied rooms). This broad definition of fuel costs also includes modelled spending on water heating, lights, appliances and cooking.

The fuel poverty ratio is defined as:

$$\text{Fuel poverty ratio} = \frac{\text{Fuel costs (usage * price)}}{\text{Full income}}$$

If this ratio is greater than 0.1 then the household is in fuel poverty.

The definition of full income is the official headline figure and in addition to the basic income measure, it includes income related directly to housing (i.e. Housing Benefit, Income Support for Mortgage Interest (ISMI), Mortgage Payment Protection Insurance (MPPI), Council Tax reduction).



Fuel costs are modelled, rather than based on actual spending. They are calculated by combining the fuel requirements of the household with the corresponding fuel prices. The key goal in the modelling is to ensure that the household achieves the adequate level of warmth set out in the definition of fuel poverty whilst also meeting their other domestic fuel requirements.

b. Fuel poverty - Low Income High Costs definition

The government has recently set out a new definition of fuel poverty which it intends to adopt under the Low Income High Costs (LIHC) framework⁵⁴. Under the new definition, a household is said to be in fuel poverty if:

- They have required fuel costs that are above average (the national median level)
- Were they to spend that amount they would be left with a residual income below the official poverty line

c. Dwellings occupied by a low income household

A household in receipt of:

- Income support
- Housing benefit
- Attendance allowance
- Disability living allowance
- Industrial injuries disablement benefit
- War disablement pension
- Pension credit
- Child tax credit
- Working credit

For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £15,860.

The definition also includes households in receipt of Council Tax reduction and income based Job Seekers Allowance.

⁵⁴ <https://www.gov.uk/government/collections/fuel-poverty-statistics>



Appendix B Methodology for the BRE Integrated Dwelling Level Housing Stock Modelling approach

This Appendix provides a more detailed description of the models which make up the overall housing stock modelling approach and feed into the housing stock condition database. The process is made up of a series of data sources and Models which, combined with various imputation and regression techniques and the application of other formulae, make up the final Housing Stock Condition Database (HSCD). The database is essentially the main output of the modelling and provides information on the Housing Standards Variables and other data requirements (e.g. energy efficiency variables). An overview of the approach and a simplified flow diagram are provided in **Section 3** of this report.

The models making up the overall housing stock modelling approach are:

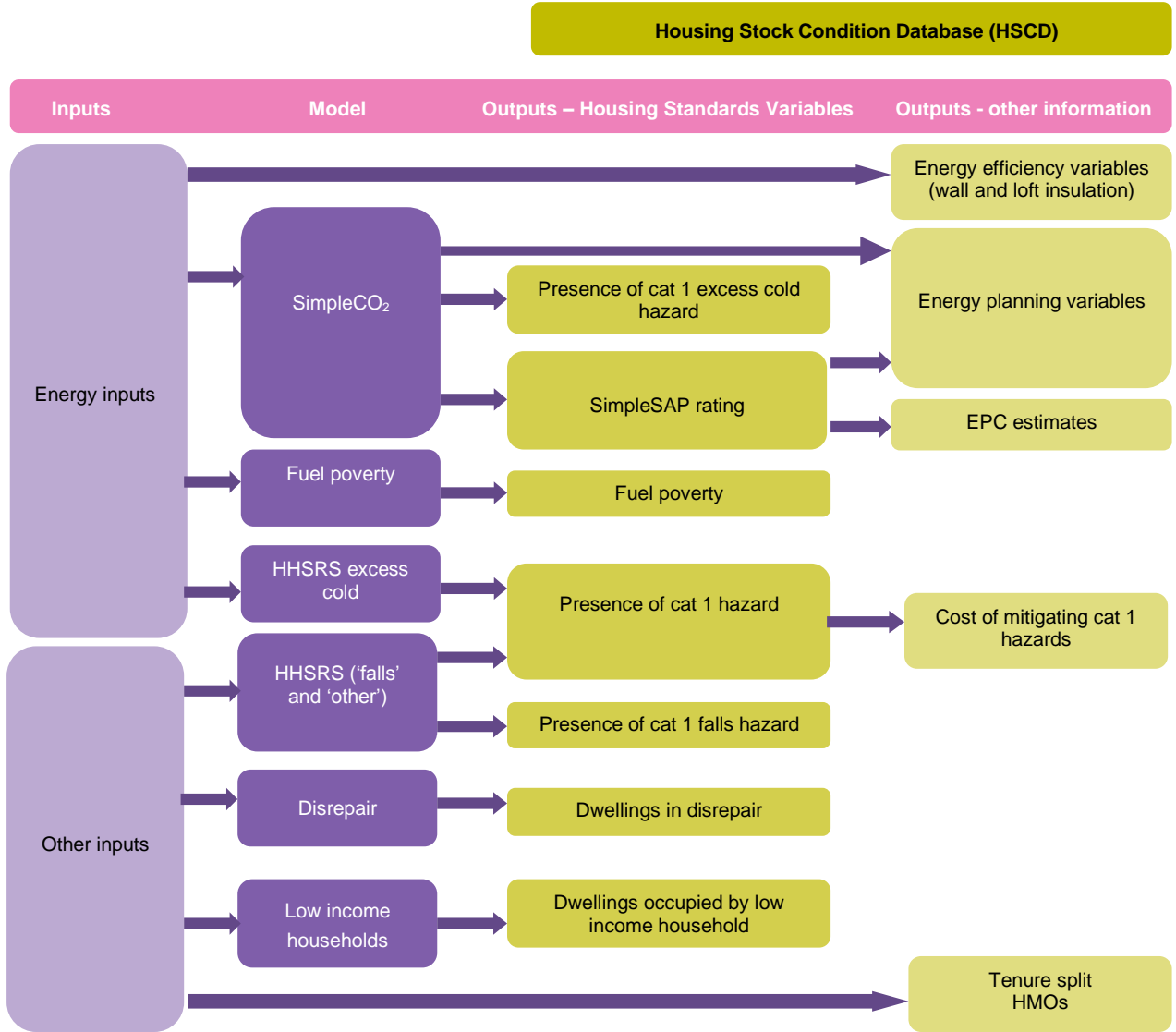
- SimpleCO₂ Model
- Fuel Poverty Model
- HHSRS (all hazards, falls hazards and excess cold) Models
- Disrepair Model
- Low Income Households Model

Figure B.1 shows the data flows for the stock modelling approach, showing which models each of the outputs in the database (split into the Housing Standards Variables and other information) come from. The exception is the energy efficiency variables (if used) which come directly from the energy inputs, and the tenure and HMO data (if used) which come directly from the other inputs.

Section B.1 describes the SimpleCO₂ Model in more detail, **Section B.2** provides more information on the other four models and **Section B.3** gives details of the OS MasterMap/geomodelling approach.



Figure B.1: Simplified data flow for the housing stock modelling approach





B.1 BRE SimpleCO₂ Model

BRE have developed a variant of the BREDEM⁵⁵ software, named “SimpleCO₂”, that can calculate outputs from a reduced set of input variables. These outputs are indicative of the full BREDEM outputs and the minimum set of variables the software accepts is information on:

- Tenure
- Dwelling type
- Location of flat (if a flat)
- Dwelling age
- Number of storeys
- Number of rooms
- Loft insulation
- Level of double glazing
- Main heating type
- Boiler type (if a boiler driven system)
- Heating fuel
- Heating system
- Heating controls
- Water heating
- Hot water cylinder insulation
- Solar hot water
- PV panels
- Internal floor area

The Experian UK Consumer Dynamics Database is used as a source for some of these variables (tenure, dwelling age) and they are converted into a suitable format for the SimpleCO₂ software. The dwelling type is derived using information from OS Mastermap and the number of storeys from OS experimental height data. The remaining pieces of data are inferred from the EHS using other tenure, dwelling age and type, other Experian data (number of bedrooms), other OS data (i.e. dwelling footprint) and data from Xoserve⁵⁶ which indicates whether the dwelling is in a postcode which is on the gas network. As the characteristics of a dwelling cannot be determined through access to observed data, a technique known as cold deck imputation is undertaken. This is a process of assigning values in accordance with their known proportions in the stock. For example, this technique is used for predicting heating fuels because the Xoserve data only confirms whether a dwelling is on the gas network or not. Fuel used by dwellings not on the gas network is unknown, so in most cases this information will be assigned using probabilistic methods. The process is actually far more complex e.g. dwellings with particular characteristics such as larger dwellings are more likely to be assigned with oil as a fuel than smaller dwellings.

⁵⁵ Building Research Establishment Domestic Energy Model, BRE are the original developers of this model which calculates the energy costs of a dwelling based on measures of building characteristics (assuming a standard heating and living regime). The model has a number of outputs including an estimate of the SAP rating and carbon emissions.

⁵⁶ Xoserve is jointly owned by the five major gas distribution Network companies and National Grid’s gas transmission business. It provides transportation transactional services on behalf of all the major gas Network transportation companies.



The reason for taking this approach is to ensure that the national proportions in the data source are the same as those found in the stock nationally (as predicted by the EHS or other national survey). Whilst there is the possibility that some values assigned will be incorrect for a particular dwelling (as part of the assignment process has to be random) they ensure that examples of some of the more unusual types of dwelling that will be present in the stock are included.

Whilst this approach is an entirely sensible and commonly adopted approach to dealing with missing data in databases intended for strategic use, it raises issues where one of the intended uses is planning implementation measures. It must therefore be kept in mind at all times that the data provided represents the most likely status of the dwelling, but that the actual status may be quite different. That said, where EPC data has been used, the energy models (which use EPC data) are likely to be more accurate.

It is important to note that some variables have been entirely assigned using cold decking imputation techniques. These include presence of cavity wall insulation and thickness of loft insulation as there is no reliable database with national coverage for these variables.

The “SimpleCO₂” software takes the combination of Experian and imputed data and calculates the “SimpleSAP” rating for each dwelling in the national database. The calculated “SimpleSAP” ratings are the basis of the estimates of SAP and excess cold. How the other key variables are derived is discussed later in this Appendix.

Because the estimates of “SimpleSAP” etc. are calculated from modelled data it is not possible to guarantee the figures. They do, however, provide the best estimates that we are aware can be achieved from a data source with national coverage and ready availability. The input data could, however, be improved in its:

- accuracy for example through correcting erroneous values,
- depth of coverage, for example by providing more detailed information on age of dwellings,
- breadth by providing additional input variables such as insulation.

Improving any of these would enhance the accuracy of the output variables and for this reason it is always worth considering utilising additional information sources where they are available. Using EPC data will go some way towards meeting these improvements by providing more accurate data.

B.2 Housing Condition and Low Income Household Models

This section provides further information on the remaining four models – fuel poverty, HHSRS, disrepair and low income households. These models are discussed together since the approach used for each one is broadly the same.

These models are not based solely on the thermal characteristics of the dwelling, and in some cases are not based on these characteristics at all. A top down methodology has been employed for these models, using data from the EHS and statistical techniques, such as logistic regression, to determine the combination of variables which are most strongly associated with failure of each standard. Formulae have been developed by BRE to predict the likelihood of failure based on certain inputs. The formulae are then applied to the variables in the national Experian dataset to provide a likelihood of failure for each dwelling. Each individual case is then assigned a failure/compliance variable based on its likelihood of failure and on the expected number of dwellings that will fail the standard within a given geographic area. Thus if the aggregate values for a census output area are that 60% of the dwellings in the area fail a particular standard then 60% of the dwellings with the highest failure probabilities will be assigned as failures and the remaining 40% as passes.



The presence of a category 1 hazard failure is the only exception to this as it is found by combining excess cold, fall hazards and other hazards such that failure of any one of these hazards leads to failure of the standard.

B.3 Integrating local data sources

As mentioned in the main body of the report, Preston identified a number sources of data which were used to update the BRE dwelling level models to provide an integrated housing stock condition database. Their data sources are shown in **Table B.1**.

To allow these data sources to be linked to the BRE Dwelling Level Stock Models, an address matching exercise was required to link each address to the Experian address key. Address matching is rarely 100% successful due to a number of factors including:

- Incomplete address or postcodes
- Variations in how the address is written e.g. Flat 1 or Ground floor flat
- Additions to the main dwelling e.g. annexes or out-buildings

Experience indicates that, for address files in good order, match rates are around 75% - 95%. **Table B.1** provides the address matching results for the three data sources provided by Preston and the resulting impact on the modelling process.

Table B.1: Address matching results and impact on the modelling process

Data source	Total no. of records	No. (and %) of addresses matched	Notes / impact on the modelling process
EPC data	43,190 – total records available	32,875 (76% - including removal of duplicates)	Data de-duplicated for multiple EPCs and final number matched to modelled data
Tenure data – tenancy deposit scheme	4,512 – total received	3,179 (70% of records provided)	3,179 – remaining records after de-duplication and address matching This data was from one of the three tenancy deposit schemes that was available at the time of project inception.

The Housing Stock Condition Database (HSCD) was also updated using the Ordnance Survey (OS) MasterMap data which enables the measurement of the footprint of the building and provides information on the number of residential addresses within the building, and to see which other buildings each address is attached to or geographically close to.

The stage at which the local data sources are included in the modelling process depends on whether or not the data includes information which can be used as an input into the SimpleCO₂ model. The simplified flow diagram in **Figure 1** in the main report shows how these data sources are integrated into the standard modelling approach.



The following sections consider each of the data sources and how they are used to update the SimpleCO₂ inputs and/or stock model outputs.

EPC data

If there are discrepancies in the energy data for the same dwelling case, arising from different energy data sources, then, if available, the EPC data will be used. If no EPC data source is available for that case, then the data with the most recent date will be taken.

Some of the energy data provided includes tenure data, in which case the housing stock condition database has been updated accordingly. However, EPC cases do not include tenure data, they only include the reason for the EPC.

Therefore:

- If the reason given was a sale then the dwelling was assumed to be owner occupied.
- If the reason given was re-letting and the tenure of the let was specified (i.e. private or social) then the tenure was changed to that indicated.
- If the reason for the sale did not indicate tenure then the tenure was left unchanged.

It is important to note that the modified tenure created from the EPC data should only ever be used for work relating to energy efficiency and carbon reduction. This is a legal requirement stemming from the collection of the data, and is a licence condition of the data suppliers, Landmark. For this reason, the tenure variable supplied in the database is NOT based on EPC data; however, the calculations used to determine the SimpleSAP rating and other energy characteristics of the dwelling do make use of the EPC tenure.

Where the energy data provides information on loft insulation, wall insulation, the location of a flat within a block and floor area this information will be used in favour of any imputed information, as long as the OS data is in agreement with the dwelling type.

Where energy data on wall type is present for a dwelling in a block of flats, terrace or semi-detached, that data is extrapolated to the rest of the block or terrace. If multiple dwellings with energy data are present then the most common wall type is used. Note that where the energy data indicates a wall type that is not the predominant one, this data will not be overwritten with the predominant type – the data reported in the energy database will always be used even if this results in two different wall types being present in a terrace or a block of flats.

For flats it is assumed that all flats in the block will have the same level of double glazing and as the case for which we have energy data for. If there are multiple flats in the block with energy data showing different levels of double glazing, an average will be used.

It is assumed that all flats in a block share the same heating type, boiler type if present, fuel type and heating controls. Where there are multiple types present, the predominant type is used. Flats are assumed to have the same hot water source, and if one flat benefits from solar hot water it is assumed that all flats in the block do.

B.4 OS MasterMap information

OS AddressBase for Wales was then linked to the OS MasterMap Topography Layer. OS MasterMap provides a detailed geographical representation of the landscape in Great Britain, including buildings. Once the OS AddressBase is linked to OS MasterMap it is possible to extract the relevant geographical information for the residential buildings in Wales – this involves looking at information about individual dwellings or blocks of flats such as footprint area and attachment to other dwellings.



Figure B. 2 shows that visual identification of dwelling type can be quite simple. The OS MasterMap of the cul-de-sac 'Prince of Wales Gardens' comprises 10 sets of semi-detached properties. BRE use this type of knowledge to create a model to infer dwelling type, which is described in more detail below.

Figure B. 2: OS MasterMap example (source OS website⁵⁷)



By looking at the number of residential address points (from OS AddressBase) it is possible to determine whether a building is a house or a block of flats⁵⁸. The dwelling type is then determined based on the spatial relationship of the individual dwelling/block of flats with other dwellings. These spatial relationships are outlined for each resulting dwelling type below:

Houses - where the dwelling is a house, the number of other buildings it is attached to can be observed and the dwelling types allocated as follows:

Detached – where a single address is within a dwelling footprint and that footprint is not attached to any other building footprint⁵⁹.

Semi-detached - where a single address is within a dwelling footprint and is joined to one other building footprint.

Terrace - where three or more building footprints are joined to one another.

⁵⁷ <https://www.ordnancesurvey.co.uk/business-and-government/products/mastermap-products.html>

⁵⁸ Houses have one residential address point and blocks of flats have two or more

⁵⁹ The area of land over which a building is constructed (i.e. the area of the ground floor only, this does not take into account the number of floors in a building)



Mid terrace – where a single address is part of a terrace block and attached to more than one other building footprint.

End terrace – where a single address is part of terrace block and attached to only one other building footprint.

Flats - if the building is a block of flats, its exact nature is determined by its age and the number of flats in the block. The following assumptions are made:

Converted flat –if there are between two and four flats in the block (inclusive) and the dwelling was built before 1980 then it is assumed to be a conversion.

Purpose built flat – all other flats are assumed to be purpose built.



Appendix C Using the BRE Integrated Dwelling Level Housing Stock Database

The BRE Housing Stock Condition Database (HSCD) is the final output of the overall stock modelling approach described in **Section 3** and **Appendix B**. The HSCD has been designed to allow local authorities to access their local area data. There are a number of different options for summarising or investigating the data and generating lists of properties of interest.

C.1 Overview

The Housing Stock Condition Database (HSCD) is now online. You can access it in <https://hscd.bregroup.com/login.jsp> with the credentials sent to you by email.

To ensure data security the interface will automatically open on the login page shown in **Figure C. 1**. Should you forget your password details, these can be reset and emailed to you using the function provided on the login page.

Upon login, the home page will open with a dashboard showing the Housing Standards Variables for your housing stock, similar to that shown in

Figure C. 2. The navigation pane is along the top and is visible on all pages; the options shown on the navigation pane will depend upon the options purchased.

Figure C. 1: Login screen

The screenshot shows the login interface for the HSCD. At the top left, it says 'HSCD delivered by bre'. At the top right is the 'bre' logo. Below the header is a grey navigation bar with a help icon and 'Log In' text. The main content area has a blue header with 'Log in' and a light blue background. It prompts the user to 'Enter your Email and password' and provides input fields for 'Username' and 'Password'. A link for password reset is provided below the password field. A 'Login' button is at the bottom right.



Figure C. 2 Home page (note screenshot below is sample data)

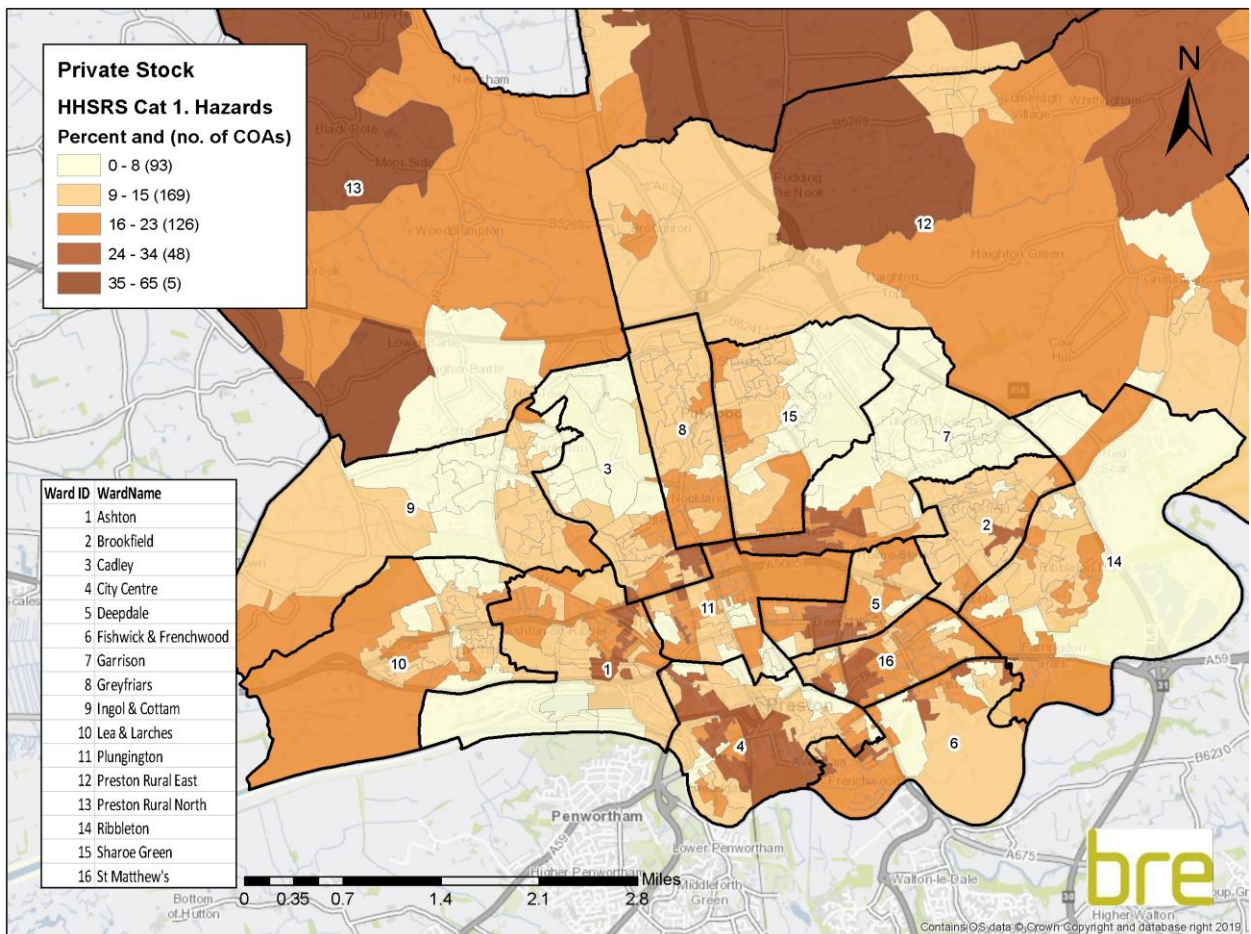


Please refer to the user guide accessible via the log in page under the [help](#) button.

Appendix D Additional Maps

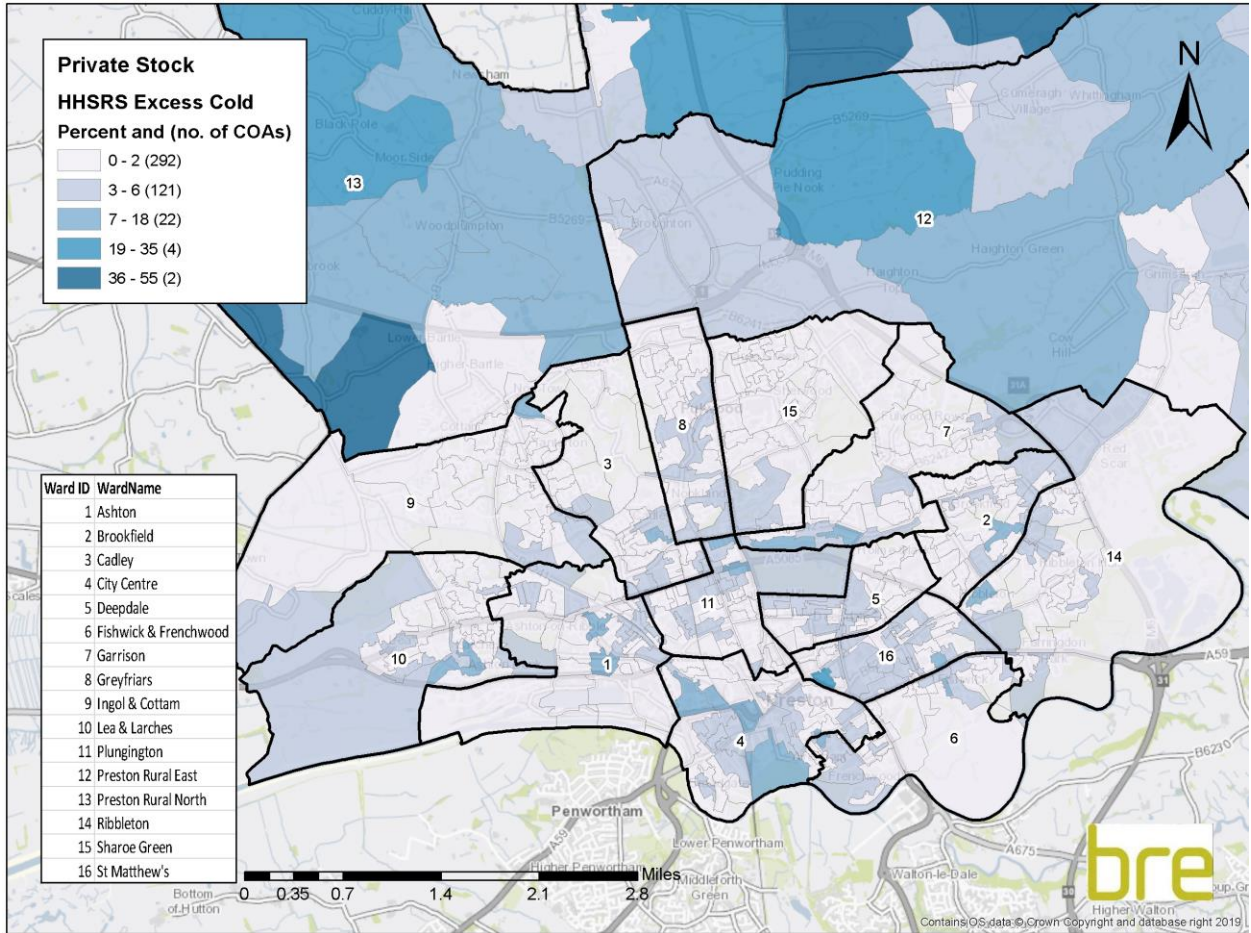
This Appendix provides close up maps for each variable, focussing in on the urban area of Preston. These maps show the clear urban – rural divide in many of the Housing Standards Variables. The larger maps included above in the report do not always allow for the appreciation that smaller and denser COAs in urban areas are very different in their hazards to the surrounding rural COAs which are larger and are immediately more eye-catching.

Map D. 1: Preston City category 1 hazards – private stock [Return to main report](#)



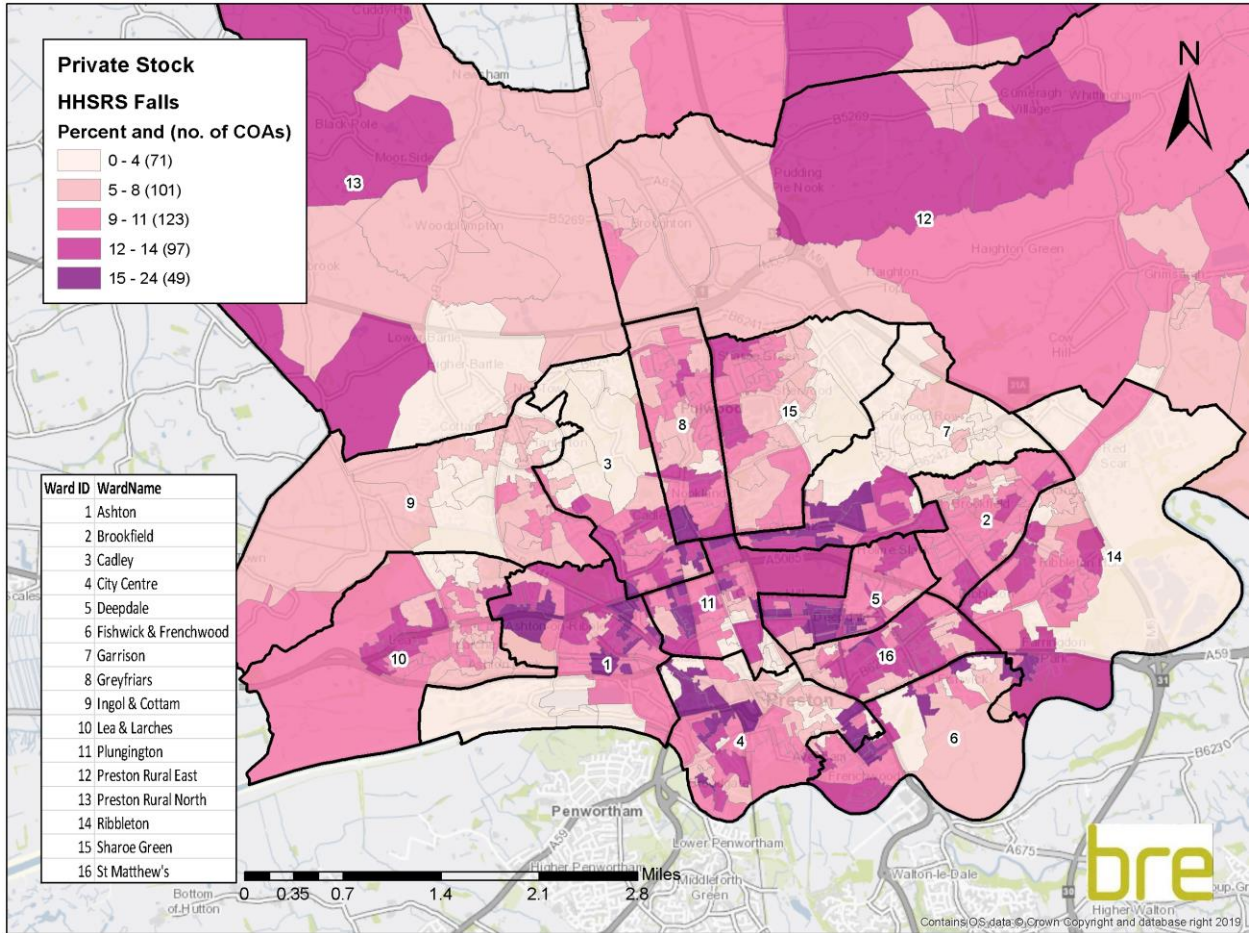


Map D. 2: Preston City households with excess cold – private stock [Return to main report](#)





Map D. 3: Preston City households with falls hazards – private stock [Return to main report](#)



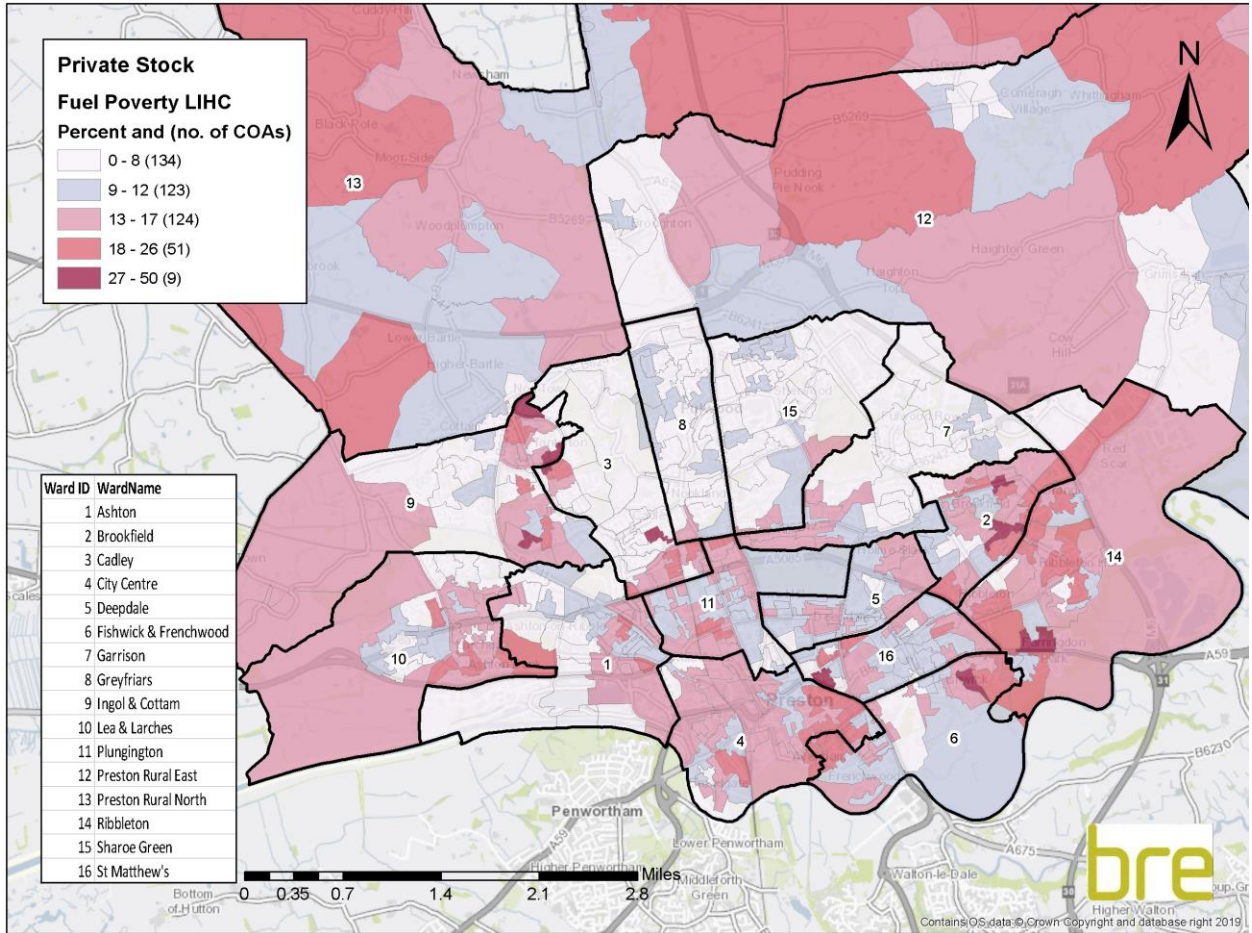


Map D. 4: Preston City households in disrepair – private stock [Return to main report](#)



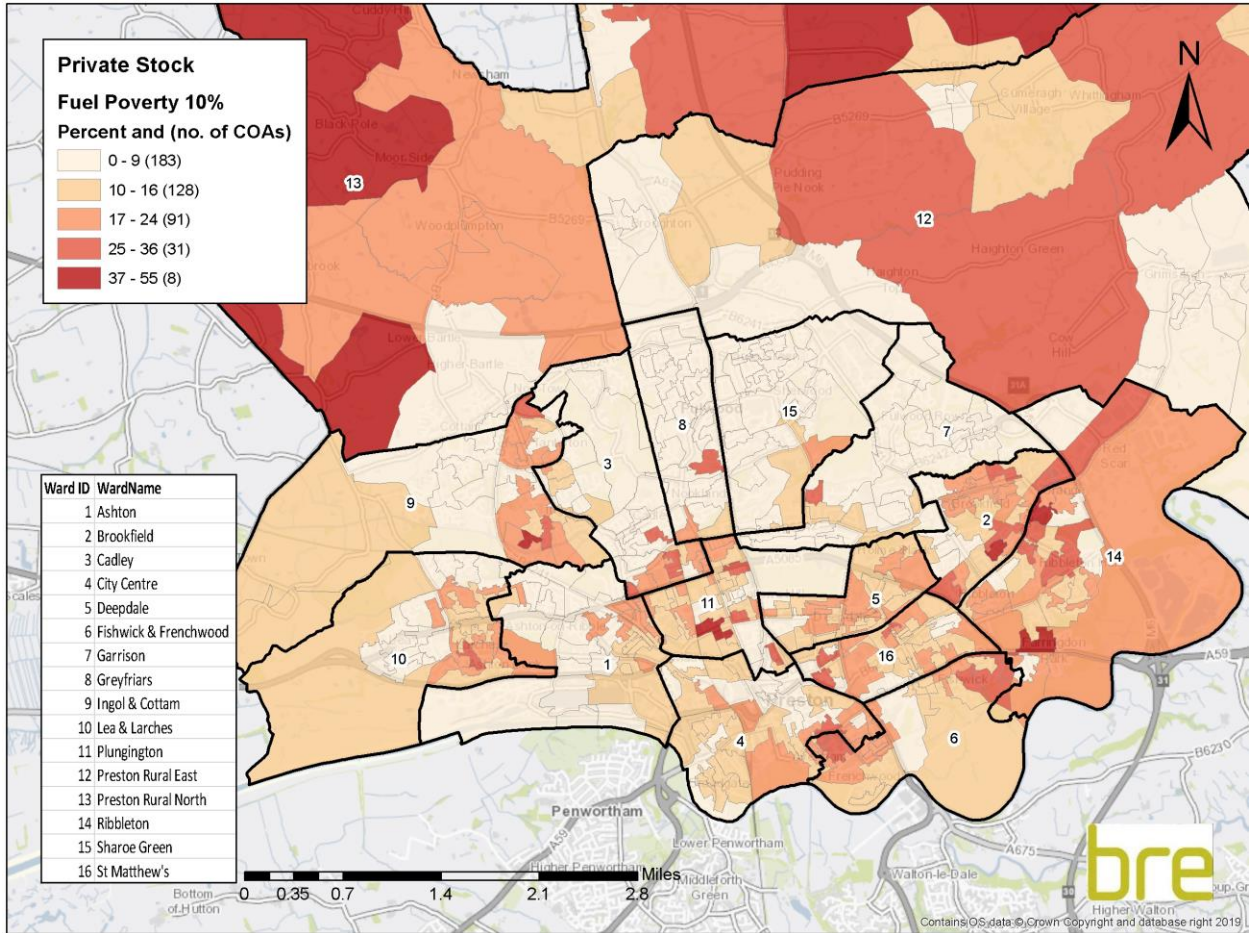


Map D. 5: Preston City households in fuel poverty (LIHC definition) – private stock [Return to main report](#)



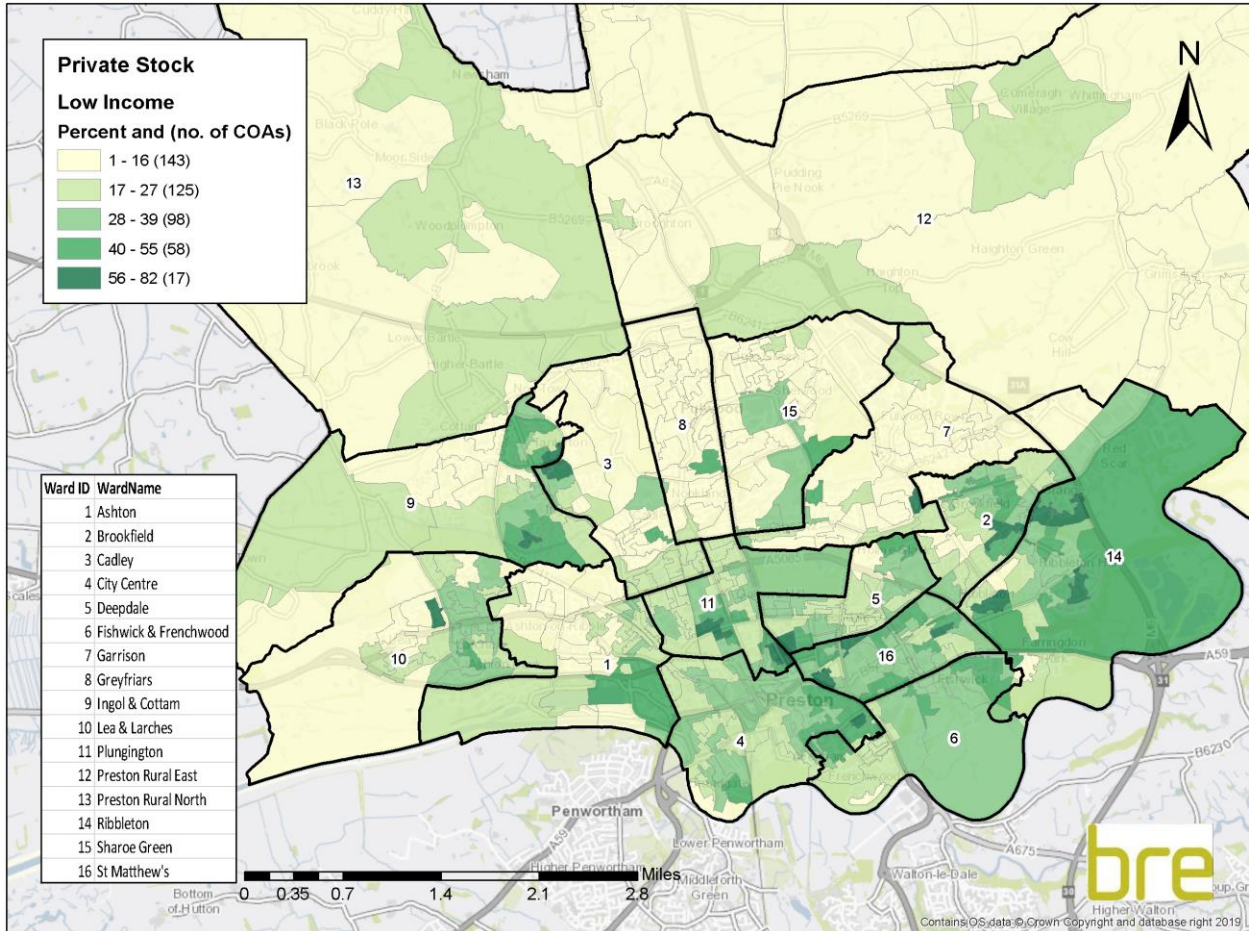


Map D. 6: Preston City households in fuel poverty (10% definition) – private stock [Return to main report](#)



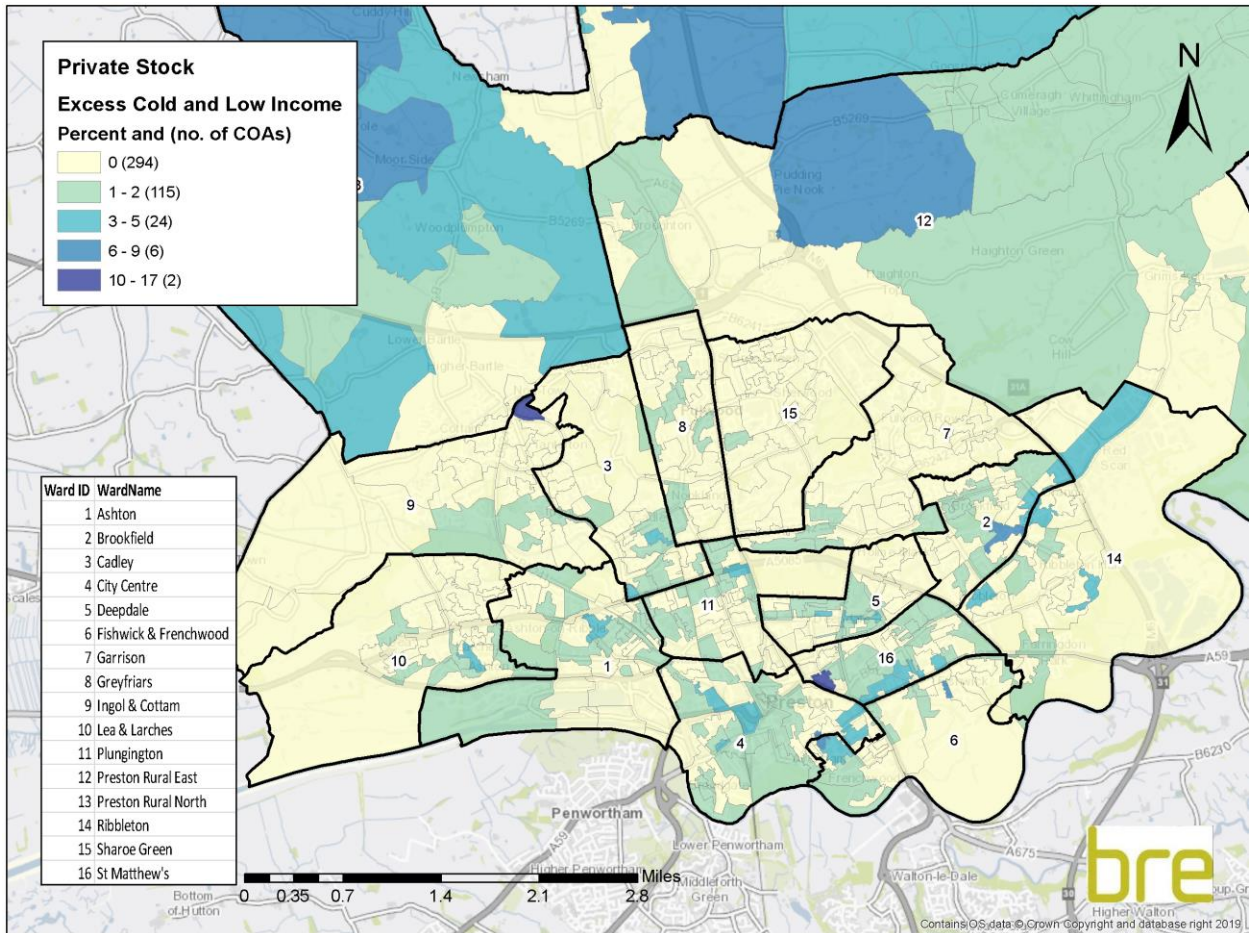


Map D. 7: Preston City households in low income – private stock [Return to main report](#)



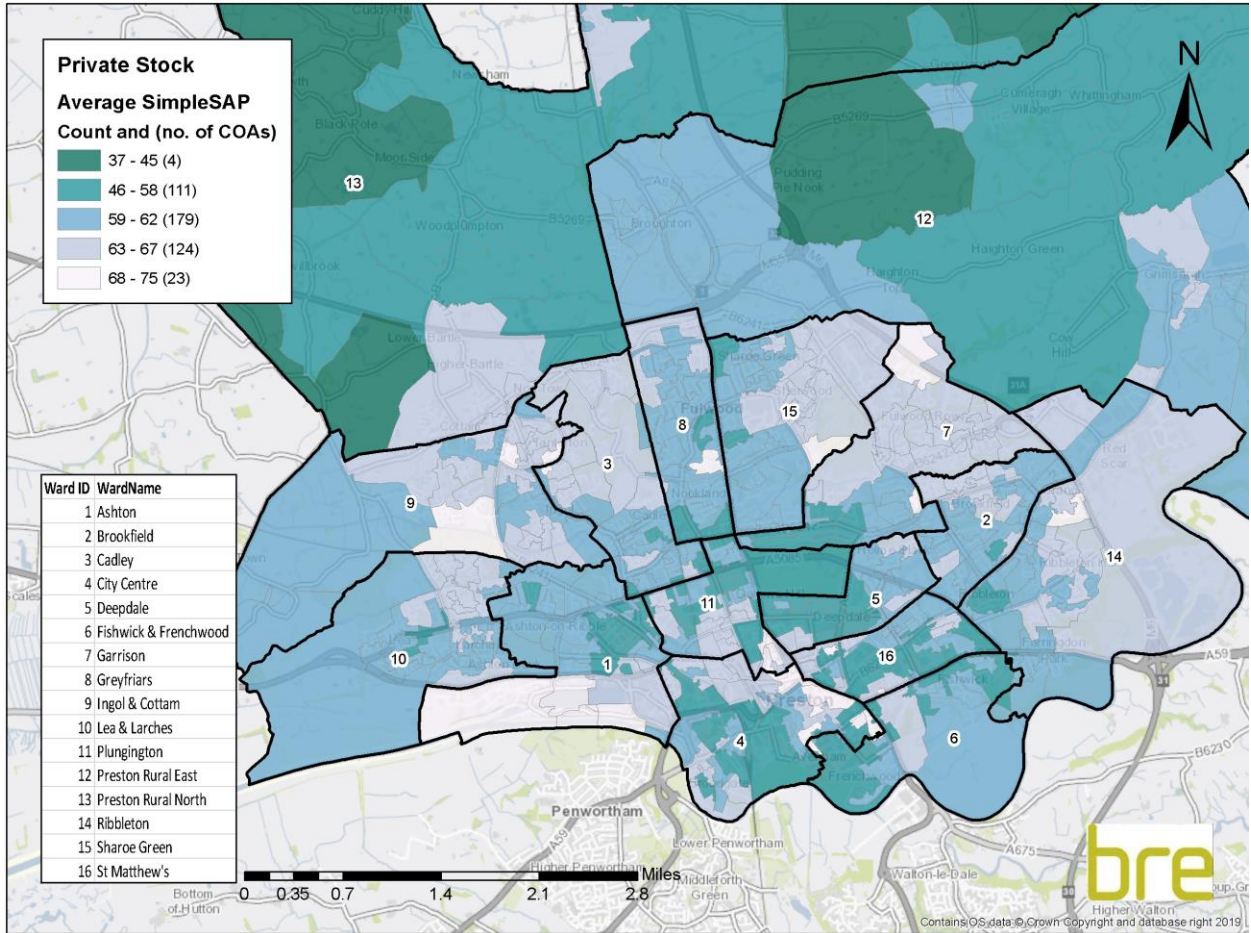


Map D. 8: Preston City households with excess cold and in low income – private stock [Return to main report](#)



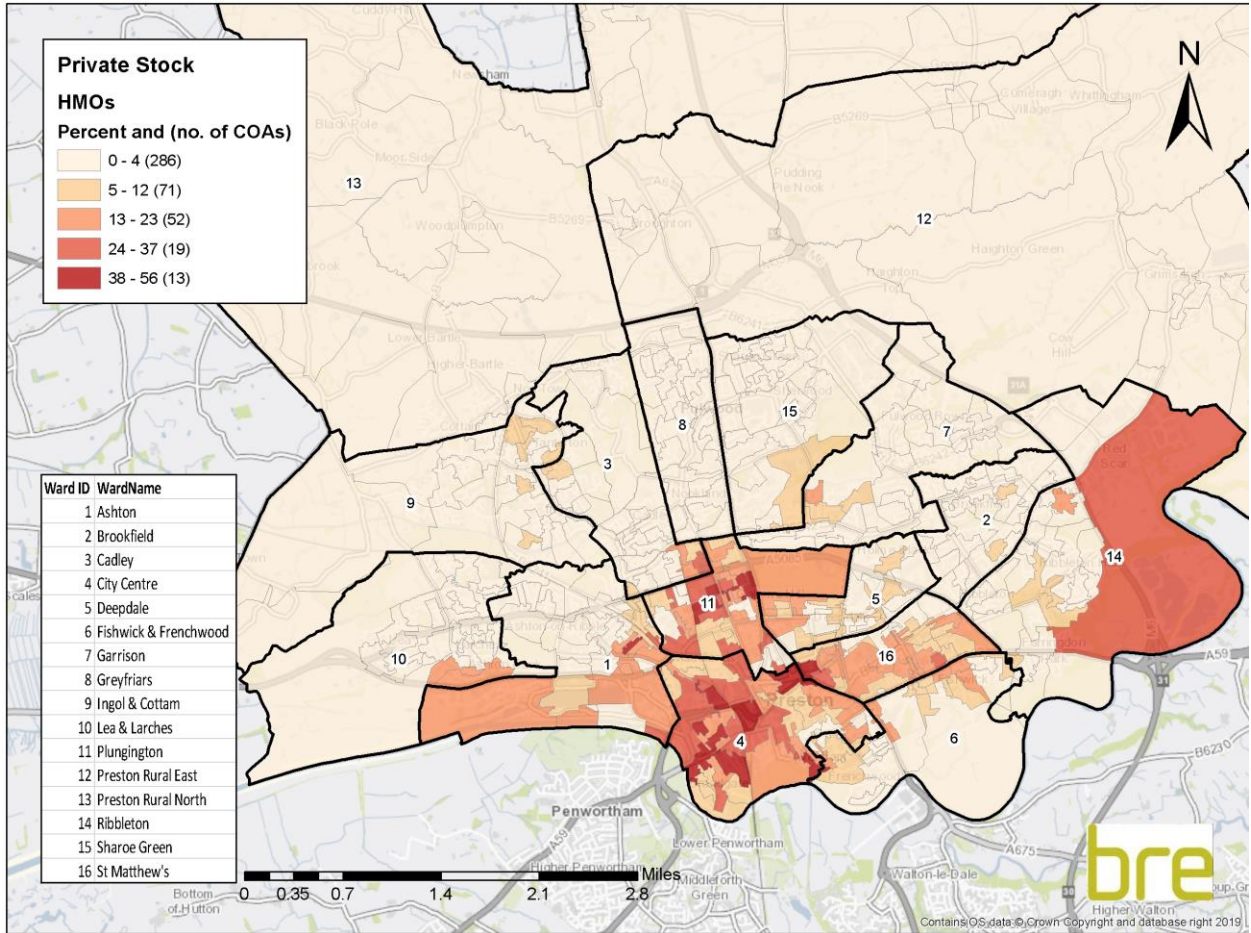


Map D. 9: Preston City average SimpleSAP households – private stock [Return to main report](#)



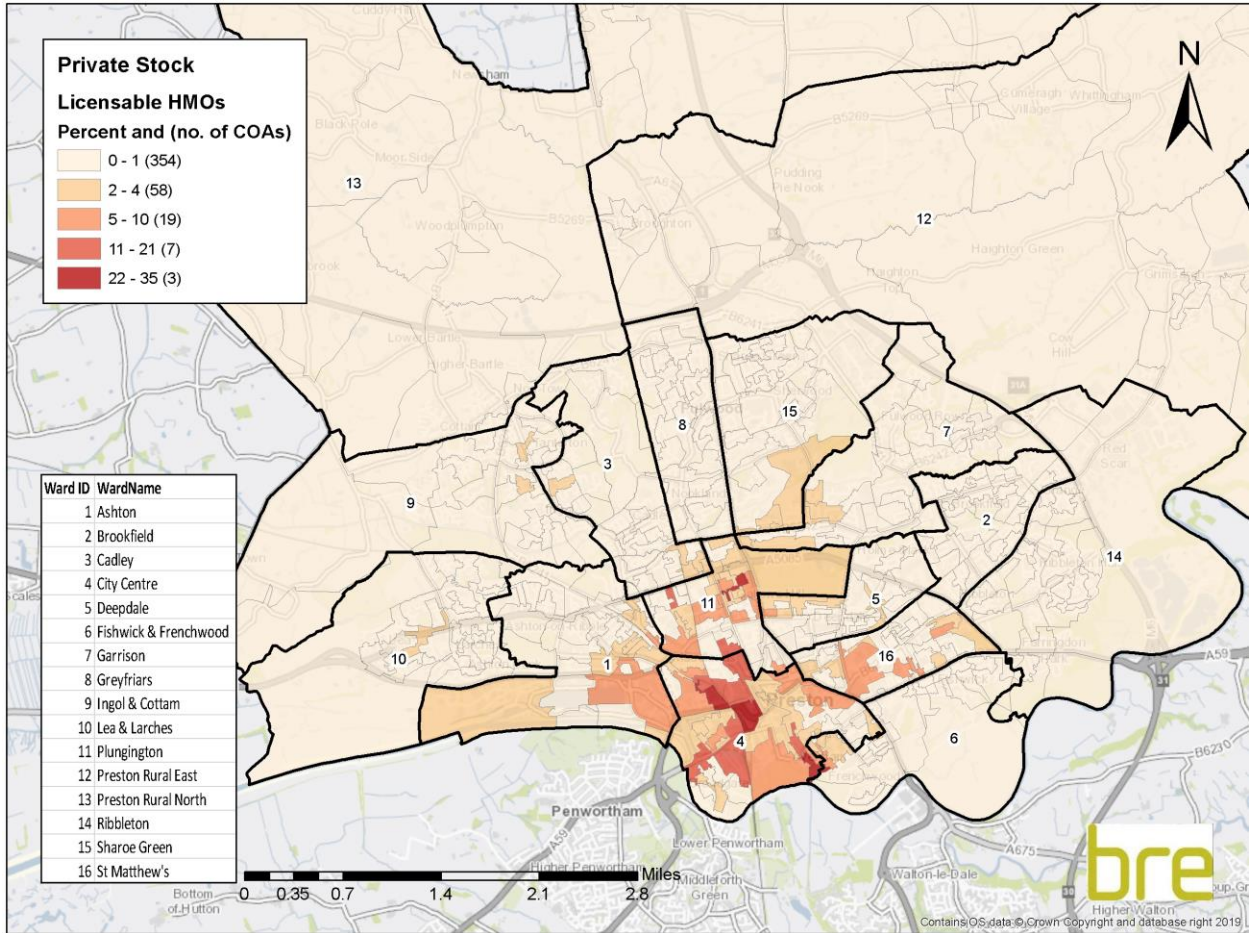


Map D. 10: Preston City HMOs [Return to main report](#)



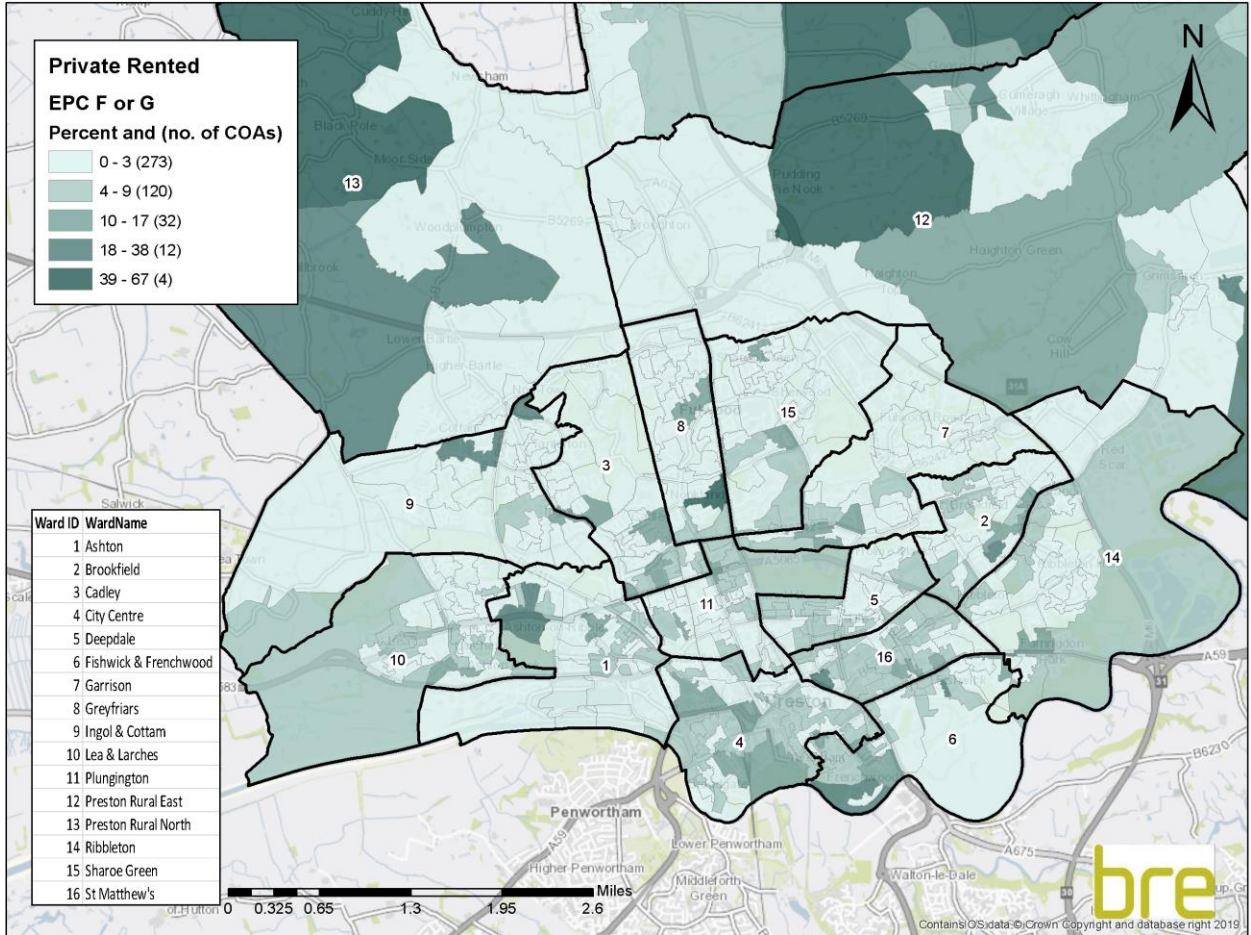


Map D. 11: Preston City mandatory licensable HMOs [Return to main report](#)





Map D. 12: Preston City households with EPC ratings F or G – private rented [Return to main report](#)





Glossary of terms

BREDEM	BRE Domestic Energy Model
Category 1 hazard	Hazards with a HHSRS score of > 1,000. A dwelling with a category 1 hazard is considered to fail the minimum statutory standard for housing
CLG	Department for Communities and Local Government
COA	Census Output Area Designed for statistical purposes, built from postcode units, approximately 125 households
Disrepair	Based on former Decent Homes Standard criteria which states that a dwelling fails this if it is not in a reasonable state of repair – this is based on the dwelling age and condition of a range of building components including walls, roofs, windows, doors, electrics and heating systems
ECO	Energy Companies Obligation Places legal obligations on the larger energy suppliers to deliver energy efficiency measures to domestic energy users
EHS	English Housing Survey A continuous national survey commissioned by the Ministry of Housing, Communities and Local Government (MHCLG). It collects information about people's housing circumstances and the condition and energy efficiency of housing in England
EPC	Energy Performance Certificate Present the energy efficiency of domestic properties on a scale of A (most efficient) to G (least efficient)
Fuel poverty	The original definition of fuel poverty states that a household is in fuel poverty if it needs to spend more than 10% of their income on fuel to maintain an adequate level of warmth (10% definition). The new definition now adopted by government is that a household is said to be in fuel poverty if they have fuel costs that are above average and were they to spend that amount they would be left with a residual income below the official poverty line (Low Income High Costs definition)
GIS	Geographic Information System A system designed to capture, store, manipulate, analyse, manage and present spatial or geographical data
HHSRS	Housing Health and Safety Rating System A risk assessment tool to help local authorities identify and protect against potential risks and hazards to health and safety related deficiencies in dwellings, covering 29 categories of hazards



HIA	<p>Health Impact Assessment</p> <p>A formal method of assessing the impact of a project, procedure or strategy on the health of a population</p>
HMO	<p>Houses in Multiple Occupation</p> <p>An entire house or flat which is let to 3 or more tenants who form 2 or more households and who share a kitchen, bathroom or toilet</p> <p>A house which has been converted entirely into bedsits or other non-self-contained accommodation and which is let to 3 or more tenants who form two or more households and who share kitchen, bathroom or toilet facilities</p> <p>A converted house which contains one or more flats which are not wholly self-contained (i.e. the flat does not contain within it a kitchen, bathroom and toilet) and which is occupied by 3 or more tenants who form two or more households</p> <p>A building which is converted entirely into self-contained flats if the conversion did not meet the standards of the 1991 Building Regulations and more than one-third of the flats are let on short-term tenancies</p> <p>In order to be an HMO the property must be used as the tenants' only or main residence and it should be used solely or mainly to house tenants. Properties let to students and migrant workers will be treated as their only or main residence and the same will apply to properties which are used as domestic refuges</p>
HSM	<p>Housing Stock Model</p> <p>Desktop based modelling used to determine the condition of the housing stock</p>
Jenks' Natural Breaks	<p>The natural breaks classification method is a data clustering method determining the best arrangement of values into different classes. It is achieved through minimising each class's average deviation from the class mean while maximising each class's deviation from the means of the other groups. The method seeks to reduce the variance within classes and maximise variance between classes thus ensuring groups are distinctive</p>
JSNA	<p>Joint Strategic Needs Assessment</p> <p>An assessment of the current and future health and social care needs of the local community</p>
LACORs	<p>Local Authority Coordinators of Regulatory Services – now renamed Local Government Regulation</p>
LAHS	<p>Local Authority Housing Statistics</p> <p>National statistics on housing owned and managed by local authorities</p>
LIHC	<p>Low Income High Cost</p>



	Measure of fuel poverty, considers a household to be in fuel poverty if required fuel costs are above average, or if they were to spend that amount they would be left with a residual income below the official poverty line
LLPG	Local Land and Property Gazetteer An address database maintained by local authorities
LSOA	Lower Super Output Area Designed for statistical purposes, built from census output areas, approximately 400 households
MHCLG	Ministry of Housing, Communities and Local Government
MSOA	Medium Super Output Area Designed for statistical purposes, built from lower super output areas, approximately 2,000 households
NHS	National Health Service
Older people	People over 65 for the excess cold hazard, people over 60 for the fire and fall hazards (excl. falling between levels)
OS	Ordnance Survey
Poor housing	Dwellings where a category 1 hazard is present
Private sector housing	Housing not owned by the local authority or a housing association
SAP	Standard Assessment Procedure Method system for measurement of energy rating of residential buildings.
SimpleSAP	An estimate of a residential dwelling's likely SAP score, it is not based on the full required range of data for a SAP calculation or a reduced data SAP calculation (RDSAP), it should only ever be considered an estimate of the SAP score, and used as a guide
UPRN	Unique Property Reference Number A unique 12 digit number assigned to every unit of land and property recorded by local authorities as part of their LLPG
Vulnerable persons	Persons who are more likely to be affected by the particular hazard as defined by the HHSRS Operating Guidance