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BRE Client Report

BRE Dwelling Level Housing Stock Modelling and Database for West Lancashire Borough Council

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Executive Summary

- West Lancashire Borough Council commissioned BRE to undertake a series of modelling exercises on their housing stock. This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.
- A previous report and database was prepared for West Lancashire Borough Council in 2015 which was based on BRE's 2014 Housing Stock Model. This current report, and accompanying database, has been produced using BRE's updated 2016 Housing Stock Model.
- The detailed housing stock information provided in this report will facilitate the delivery of West Lancashire'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 Company Obligation (ECO).
- The main aims of this work were to provide estimates of:
    - The percentage of dwellings meeting each of the key indicators[1] for West Lancashire 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 information on EPC ratings
- BRE Housing Stock Models were used to provide such estimates at dwelling level with a focus on private sector housing. The key indicators provide West Lancashire 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 2016 models have been updated to make use of the results of the 2012 English Housing Survey (EHS)[2] . The new models also make more use of Ordnance Survey (OS) data. OS Address Premium is used as a basis for the list of all dwellings in the authority, and applying improved geo-modelling[3] 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 has been replaced with an updated model based on the 2012 version of the Government's Standard Assessment Procedure (SAP), and the methods for imputing the inputs to this model have also been upgraded, including the incorporation of some new information 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

[1] 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.

[2] 2012 is the latest available data. Prior to the 2016 models EHS 2011 data was used.

[3] 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.

key indicators. These outputs can then be mapped to provide the authority with a geographical distribution of each of the key indicators which can then be used to target resources for improving the housing stock.

- The headline results are as follows:

Headline results for West Lancashire

There are 8,121 dwellings in the private sector stock with category 1 Housing Health and Safety Rating System (HHSRS) hazards. *See full results*

The highest concentrations of all HHSRS hazards in the private sector are found in the wards of Newburgh, Scarisbrick and Bickerstaffe. *See full results*

Of these hazards, 7,071 are in the owner occupied sector and 1,050 are in the private rented sector. This equates to 19% of owner occupied dwellings containing hazards, and 20% of properties in the private rented sector. *See full results*

The highest concentrations of fuel poverty (Low Income High Cost definition) in the private sector are found in the wards of Digmoor, Moorside and Skelmersdale South and for excess cold the highest levels are in the Newburgh, Scarisbrick and Bickerstaffe wards. *See full results*

The average SimpleSAP rating for all private sector dwellings in West Lancashire is 55, which is the same as England but worse than North West (58). For the owner occupied stock in West Lancashire the figure is 55 and for the private rented sector it is 56. *See full results*

Maps by COA have been provided for the above key indicators. *See maps*

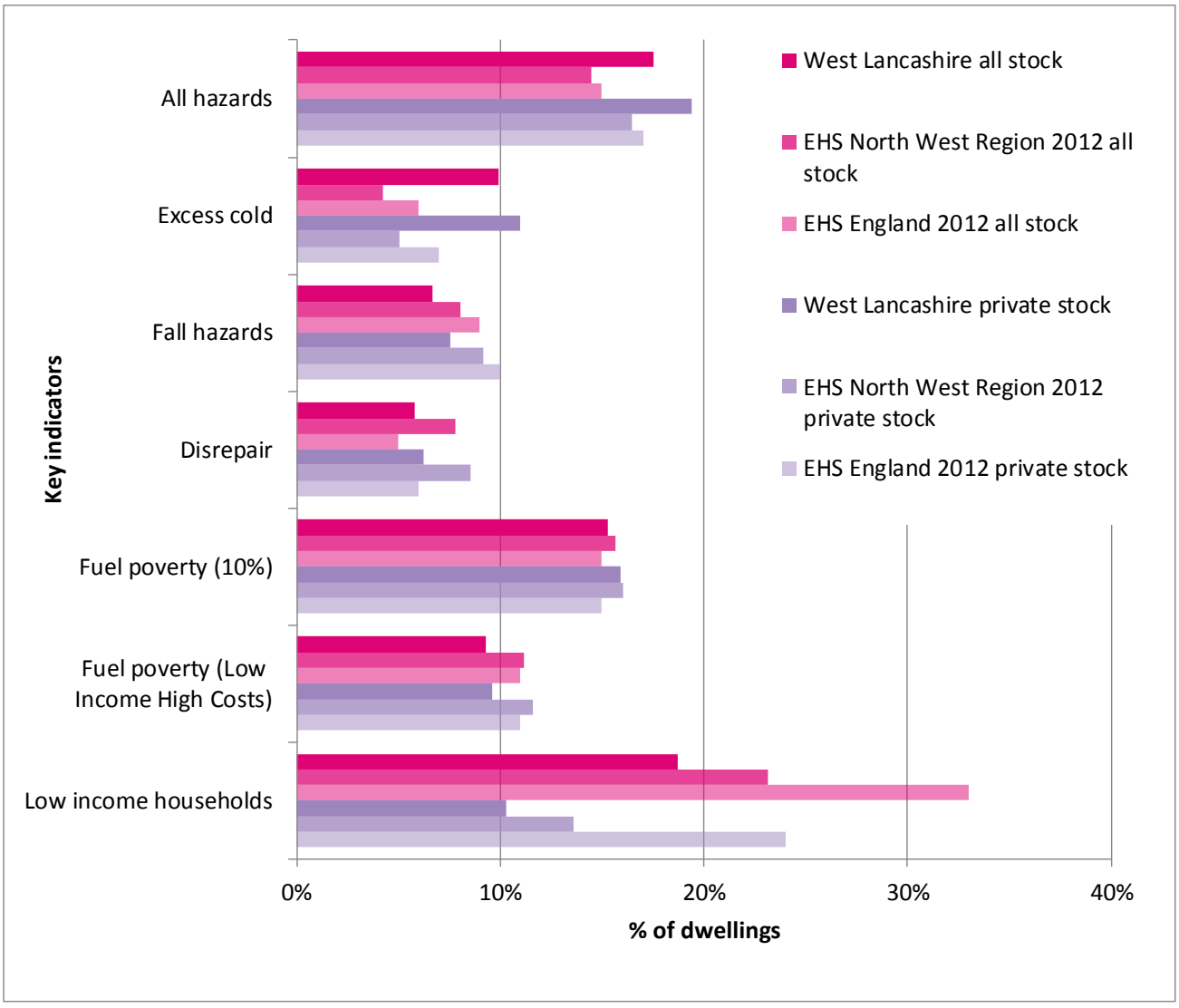
The total cost of mitigating category 1 hazards in West Lancashire's private sector stock is estimated to be £47.1 million. *See full results*

14.5% (6,058) of *private sector* dwellings and 12.3% (660) of *private rented* dwellings in West Lancashire are estimated to have an EPC rating below band E. *See full results*

Key illustrations of headline results

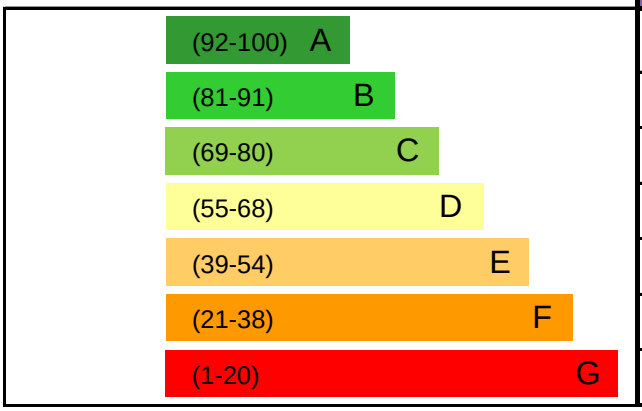
- The table below shows the results for 7 of the key indicators in West Lancashire compared to the North West and England (EHS 2012) and split into all stock and private sector stock. The data shows that private stock in West Lancashire performs considerably worse than England excess cold, worse for all hazards and excess cold, slightly lower for falls, similar for disrepair and fuel poverty and lower for low income households. A similar picture can be seen when comparing West Lancashire to the North West region; with the exception of disrepair which is less than the regional average.

Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the housing stock models and database for all stock and private sector stock – West Lancashire compared to the North West and England (EHS 2012)



- The table below shows the number and percentage of West Lancashire's private rented stock falling into each of the EPC ratings bands (based on SimpleSAP). This shows that the majority of properties in the private rented sector fall in the bands C to E. Compared to England, the distribution of EPC ratings across the bands is very similar, with a slightly higher proportion of dwellings in bands D and F, but a slightly lower proportion in band E.

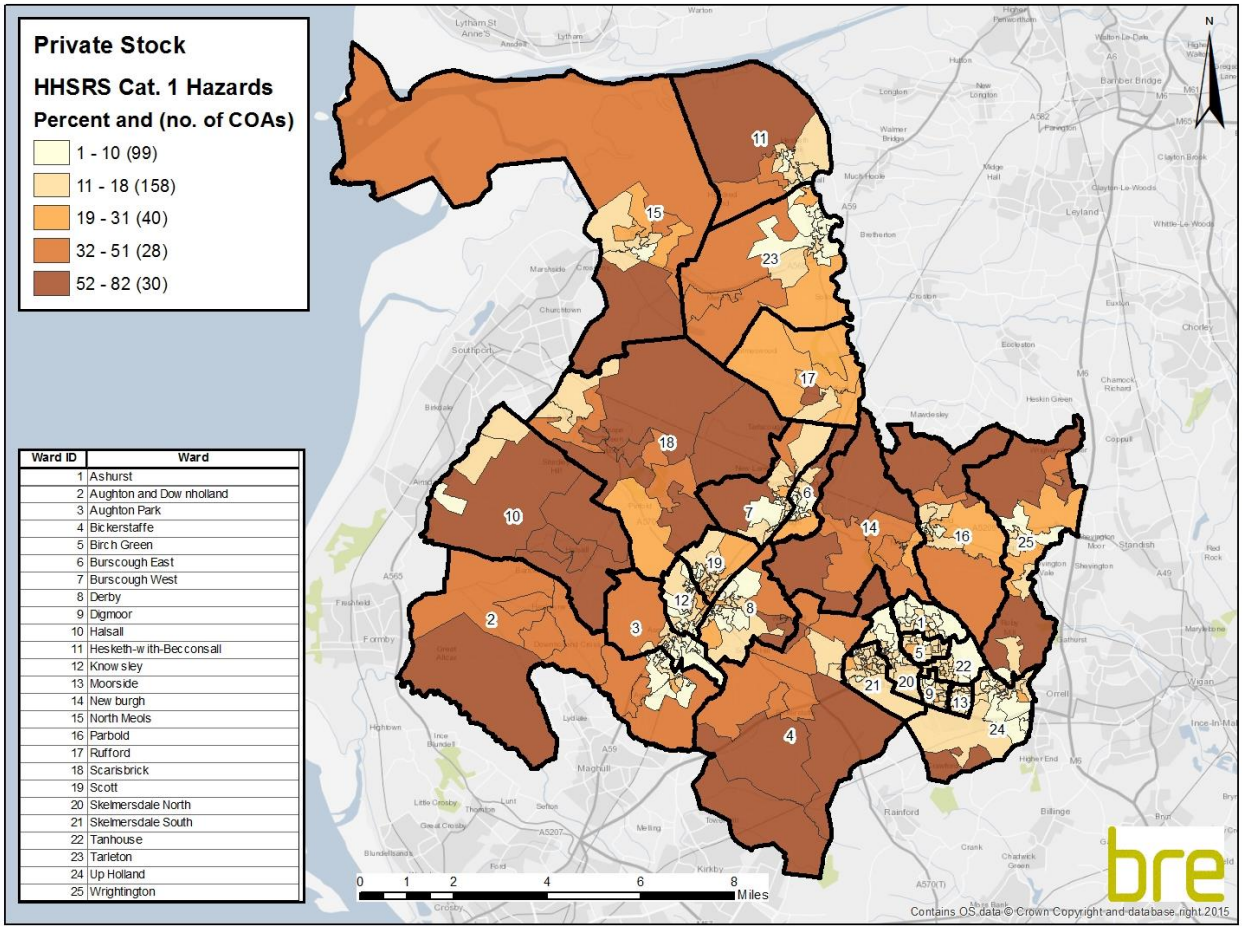
Number and percentage of West Lancashire's private rented stock falling into each of the EPC ratings bands (based on SimpleSAP), compared to England (2012 EHS) figures



	West Lancashire		2012 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	1.0%
(81-91) B	7	0.1%	
(69-80) C	961	17.9%	18.9%
(55-68) D	2,645	49.4%	46.2%
(39-54) E	1,083	20.2%	24.5%
(21-38) F	505	9.4%	7.0%
(1-20) G	155	2.9%	2.5%

- The map below shows the distribution of category 1 hazards, as defined by the Housing Health and Safety Rating System (HHSRS), across the local authority area. The map shows that there are concentrations of high levels of hazards in Newburgh, Scarisbrick and Bickerstaffe wards.

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



Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

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1 Introduction

West Lancashire Borough Council commissioned BRE to undertake a series of modelling exercises on their housing stock. This report describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.

A previous report and database was prepared for West Lancashire Borough Council in 2015 which was based on BRE's 2014 Housing Stock Model. This current report, and accompanying database, has been produced using BRE's updated 2016 Housing Stock Model.

The stock models and database provide the council with dwelling level information on various key housing indicators, focussing on private sector housing. The key indicators provide West Lancashire 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 key indicators are split into indicators related to house condition, energy efficiency and household vulnerability as shown in **Table 1** (see **Appendix A** for full definitions):

Table 1: Key indicators split into categories

Indicator	House condition indicators	Energy efficiency indicators	Household vulnerability indicators
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% and 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 indicators shown in **Table 1** can also be combined within the database to provide powerful information on the housing stock, for example dwellings suffering from excess cold and also occupied by households on a low income. The true potential of the database lies in its ability to produce combined indicators such as this, as it allows council officers to explore the stock and to assess the likely scope of any programmes they might wish to implement.

It is also possible to extract other information from the database which is of use to local authorities. This information includes estimates relating to the Department for Communities and Local Government's (DCLG) Local Authority Housing Statistics (LAHS) reporting of Energy Performance Certificate (EPC) ratings, costs of mitigating hazards.

The key indicators and other information are derived from the Housing Stock Database which is made up of a series of Dwelling Level Stock Models. The BRE Dwelling Level Stock Models have been used for many years to provide key housing indicators to local authorities. The most recent 2016 models have been updated to make use of the results of the 2012 English Housing Survey (EHS)[4] as well as making more use of Ordnance Survey (OS) data. OS Address Premium is used as a basis for the list of all dwellings in the authority, and applying improved geo-modelling[5] 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 has been replaced with an updated model based on the 2012 version of SAP, and the methods for imputing the inputs to this model have also been upgraded, including the incorporation of some new information 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 key indicators.

The information in the database 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 2004[6].

Furthermore, having this information available will also help to facilitate the delivery of West Lancashire'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.

1.1 Project aims

The main aim of this project was to provide data on key private sector housing indicators for West Lancashire. The main aims of this work were therefore to provide estimates of:

- The percentage of dwellings meeting each of the key indicators for West Lancashire overall and broken down by tenure and then mapped by COA (private sector stock only), including a brief comparison with the results of the previous 2014 BRE Housing Stock Model.
- Information relating to LAHS reporting for the private sector stock - category 1 hazards and 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. Finally, this report provides the modelling results for West Lancashire covering each of the main aims above.

[4] 2012 is the latest available data. Prior to the 2016 models EHS 2011 data was used.

[5] 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.

[6] http://www.legislation.gov.uk/ukpga/2004/34/contents

2 Policy background

The detailed housing stock information provided in this report will facilitate the delivery of West Lancashire'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 polices 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 2004[6] 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"[7] 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 West Lancashire in recent years from 5% of the total stock in 2001 to 12% in 2011[8] – an increase of 7%. This is lower than the 14% increase seen in England as a whole.

2.2.2 Health inequalities

The government's white paper "Choosing Health"[9] 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

[7] Laying the Foundations: A Housing Strategy for England, CLG, 2011

[8] https://www.gov.uk/government/collections/dwelling-stock-including-vacants

[9] Choosing Health: Making healthy choices easier, Department of Health, 2004

reflecting local needs. Housing is a key determinant of health, and poor housing conditions continue to cause preventable deaths and contribute to health inequalities[10]. 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"[11].

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"[12] 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

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 "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"[13].

[10] The health impacts of poor private sector housing, LACORS, 2010

[11] Integrated Care: Our Shared Commitment, Department of Health, 2013

[12] Healthy lives, healthy people: Improving outcomes and supporting transparency, Department of Health, 2013

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

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, from 2018 it will be unlawful for landlords to rent out properties that do not reach a minimum standard of energy efficiency (likely to be set at Energy Performance Certificate rating E[14]). While there will be various caveats to these powers, they will provide a new minimum standard for rented accommodation. Part of this current project for West Lancashire includes provision of a private rented sector variable that should assist in identifying such dwellings.

2.2.7 Empty homes

Empty homes brought back into use will qualify for the New Homes Bonus where, for the following 6 years, the government will match fund the Council Tax on long term empty properties brought back into use. In addition, from 2012-15, £100million of capital funding from within the Affordable Homes Programme will be available to tackle problematic[15] empty homes. Whilst the data provided by this project cannot necessarily assist with the actual identification of empty homes, the database provided would be the logical place for such information to be stored should it be gathered from other sources.

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.

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.

The latest information for West Lancashire collected by DCLG identifies 1,559 vacant dwellings across all tenures. This represents a vacancy rate of approximately 3% in West Lancashire, compared to a figure of 3% in England. Furthermore, 1% (641) of these dwellings are long-term vacant (6 months or more) in West Lancashire, compared to a figure of 1% for England as a whole.

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 Welfare Reform Act 2012

The key parts of this act for environmental health services are 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.

[14] https://www.gov.uk/getting-a-green-deal-information-for-householders-and-landlords

[15] Properties that are likely to remain empty without direct financial support from government.

2.3.2 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.

2.3.3 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)[16] 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:

- Total number of dwellings and number of private sector dwellings with category 1 HHSRS hazards and the estimated costs of mitigating these
- Estimates of the number of HMOs and the number of mandatory licensable HMOs

Whilst the LAHS no longer requires reporting of average EPC ratings of the private sector stock and the proportion below a certain rating, this information remains pertinent due to the Energy Act 2011. Under this act new rules mean that from 2018 landlords must ensure that their properties meet a minimum energy efficiency standard. Subject to Parliamentary approval, this minimum standard has been set at band E by 1 April 2018[17, 18]. 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[19] statistics and EPC ratings can be found in **Section 4.2**.

[16] https://www.gov.uk/government/publications/completing-local-authority-housing-statistics-2014-to-2015-guidance-notes

[17] https://www.gov.uk/government/consultations/private-rented-sector-energy-efficiency-regulations-domestic

[18] 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.

[19] Not including HMOs as this variable has not been purchased.

2.5 The Energy Companies 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 (from 1 January 2013 - 31 March 2015 and recently extended to March 2017[20]). The 3 different ECO obligations are:

- Carbon Emissions Reduction Obligation (CERO)
- Carbon Saving Community Obligation (CSCO)
- Home Heating Cost Reduction Obligation (HHCRO) or Affordable Warmth

ECO2 is now underway and runs from April 2015 to March 2017 – the 3 obligations remain as above and have similar pro-rated targets as ECO but with some different definitions and routes to achieving targets.

An understanding of the ECO criteria is pivotal to building a local authority's strategy for levering in finance to improve the energy efficiency of the stock. Of particular interest are properties with HTT cavities and their role in the Carbon Emissions Reduction Obligation. Despite the recent changes in ECO2, this obligation has by far the greatest savings target attached to it and HTT cavities are a particular focus of energy company interest due to their relatively low cost to install improvements compared to solid wall insulation which is the other key criterion for CERO eligibility. 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.

It should be noted that whilst funding for the Green Deal and the Home Improvement Fund has recently been withdrawn[21], the ECO will continue to run until March 2017.

[20] Although energy companies have been able to count measures delivered since October 2012 against their targets.

[21] Funding has been withdrawn as of 23 July 2015; however, there will be no impact on existing Green Deal Finance Plans or Green Deal Home Improvement Funds – hhtps://www.gov.uk/government/news/green-deal-finance-company-funding-to-end

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 key indicators (and other outputs of interest). These outputs can then be mapped to provide the council with a geographical distribution of each of the key indicators which can then be used to target resources for improving the housing stock. The process itself is actually made up of a variety of data sources, calculations and models.

The models are principally informed by the Department for Communities and Local Government's (DCLG) English Housing Survey (EHS)[22]. The survey is not used to supply data for the database, but rather it allows the identification of patterns in the housing stock, so that this knowledge can be applied, in the form of mathematical algorithms, to impute key indicators and energy characteristics from other data available at the national level. The particular approach for West Lancashire, however, makes significant use of the Experian UK Consumer Dynamics Database of dwelling and household indicators as inputs to the models. One example is the BRE SimpleCO_2 Model which is based on dwelling level inputs from Experian and expands on these using imputation techniques to provide sufficient information to calculate the likely energy efficiency of each dwelling in the stock. Some of the key housing indicators, such as HHSRS excess cold category 1 hazards and BRE's SimpleSAP[23], can be directly inferred from this data.

The modeling process is complex, but in summary comprises a number of steps:

1. Identification of the archetype of each dwelling in the local authority area i.e. the age, tenure and type. This enables comparison with the archetypes identified by the EHS. This is mainly done using Experian data.
2. Construction of a better understanding of each dwelling - for example fuel type, wall type, floor area, levels of insulation etc. to allow an assessment of energy efficiency. Where the data to complete this does not exist, the models make predictions using the patterns and understanding from the EHS.
3. When details about the dwelling have been collated, an assessment of the energy efficiency of each property is carried out using a simplified SAP calculation (using the 2012 version of SAP) relying on a reduced number of inputs. This predicts CO_2 emissions and the likely existence of a category 1 hazard for excess cold by using a SAP rating of 33.5 as a proxy as per the EHS.

[22] The most recent survey used in the housing stock models is 2012.

[23] A simplified version of the SAP model that produces an output broadly comparable to SAP. The SimpleSAP model is distinct from both full SAP and RD SAP in that uses a smaller, simplified set of inputs.

4. Calculation of the likelihood of a dwelling failing other standards with reference to the relationships identified from EHS - i.e. the combination of variables that are most strongly associated with failure of a particular standard.

Figure 1 shows a simplified flow diagram of the overall BRE housing stock modelling approach. 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 key indicators 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, Experian, Xoserve data, Ordnance Survey (OS) MasterMap, Royal Mail postcode data. Note that the EHS data itself is not directly used (i.e. the database does not include EHS data) but rather it enables the modelling process to be carried out.

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

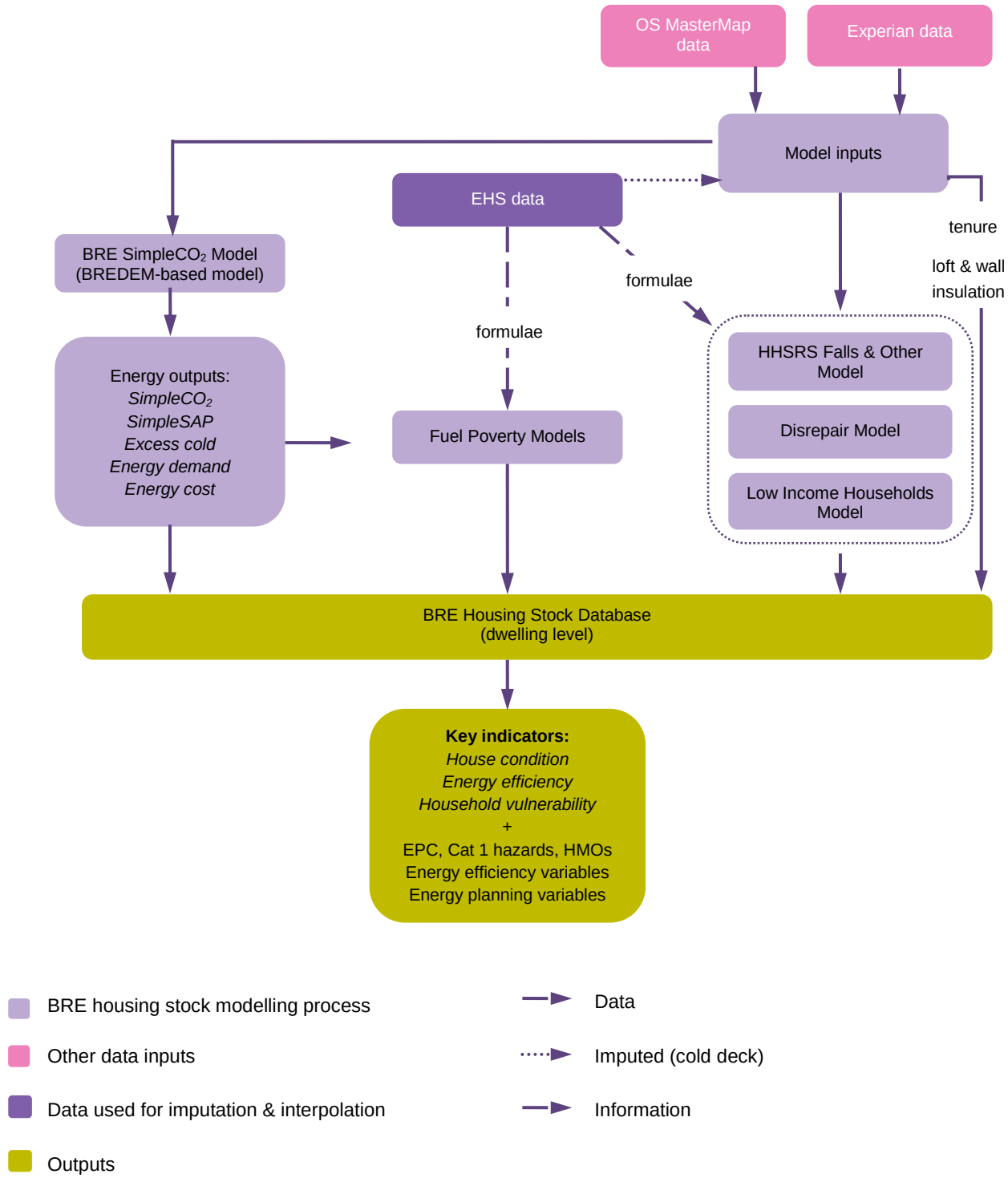
The data sources and models are linked as shown in the flow diagram and the modelling process itself can be divided into “energy inputs” and “other inputs”, which are summarised as follows:

Energy inputs - these are the inputs required by the simplified SAP model and are developed from the data sources listed above. The EHS data is used to impute (using cold deck imputation[24]) and interpolate where there are gaps in the data. The “energy inputs” are then fed into the SimpleCO_2 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 imputation[24]) 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).

[24] 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)



3.2 Breakdown of the housing stock by tenure - validation

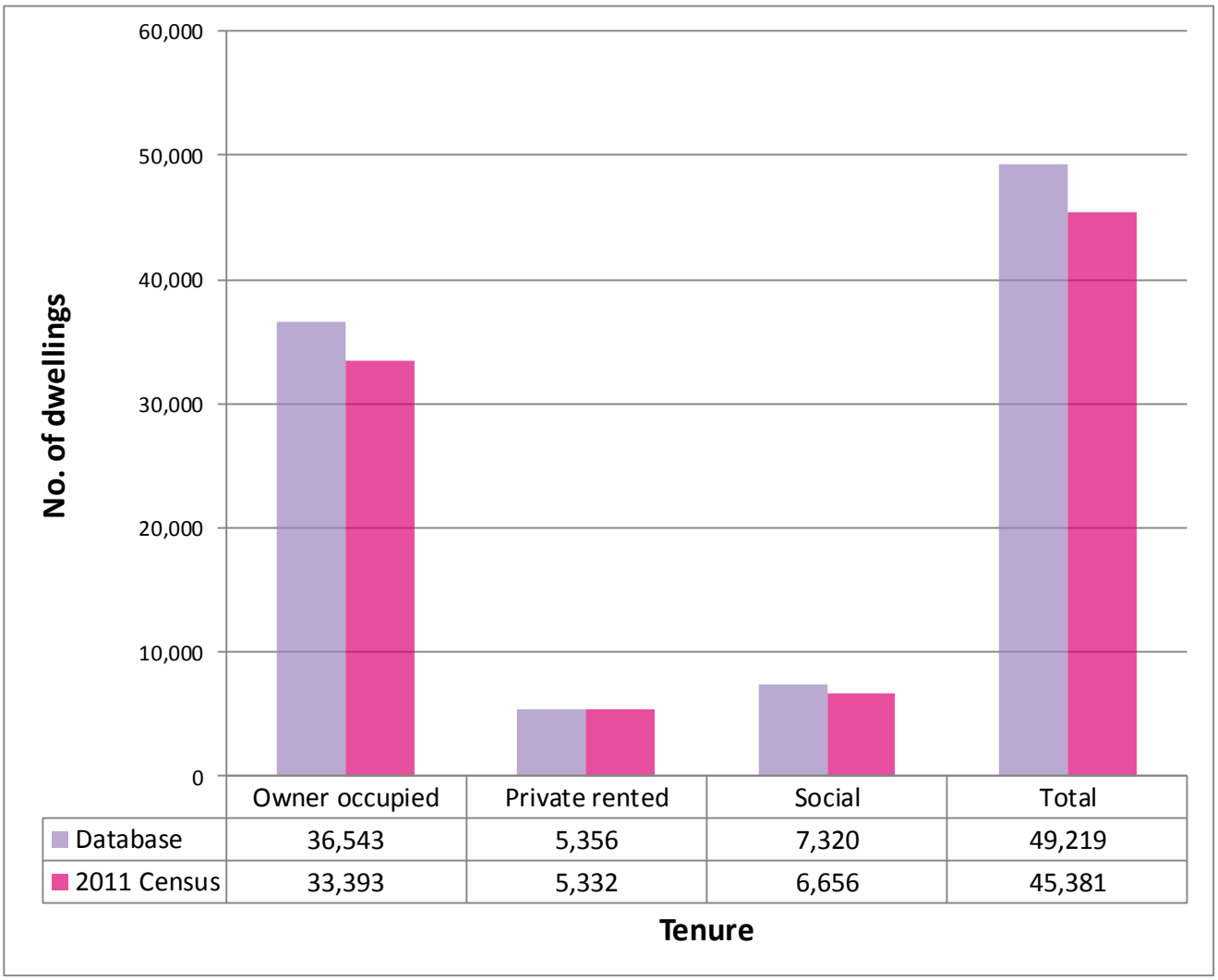
Providing the results split by tenure is useful since it can have an effect on how resources and improvement policies are targeted. This report is particularly focussed on private sector stock which is made up of owner occupied and private rented dwellings. The remainder of the housing stock consists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

The total number of dwellings in West Lancashire from the BRE database uses the tenure split derived from the purchased Experian tenure variable.

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 figures[25]. The results of the validation exercise show that the differences between the tenure split from the database compared to the Census figures are relatively small (see **Figure 2**), suggesting that the database should provide a good overview of the housing stock in West Lancashire. Furthermore, **Maps 1** and **2** show that the geographical distributions look very similar, again giving confidence that the database provides a good overview of West Lancashire's housing stock.

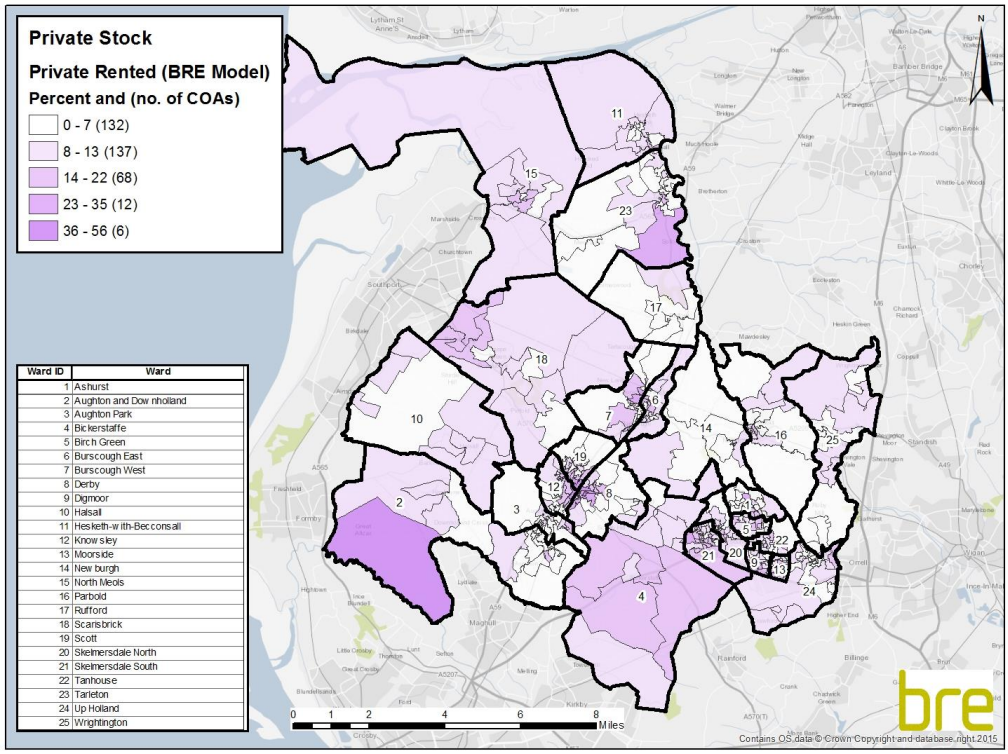
[25] http://www.ons.gov.uk/ons/datasets-and-tables/index.html

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

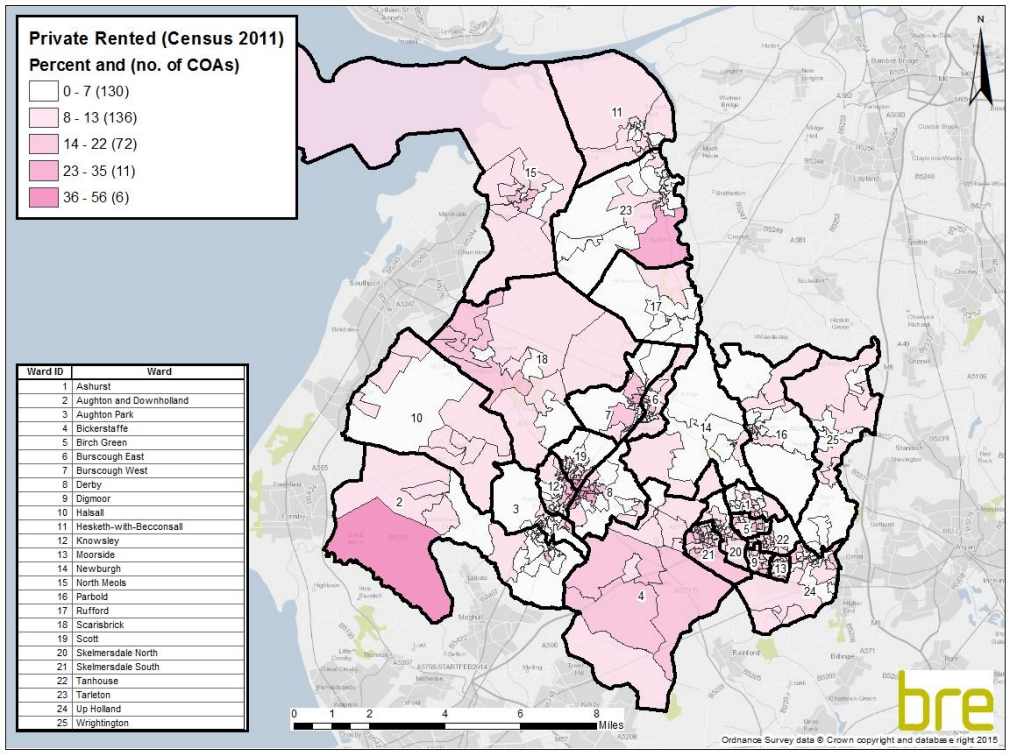


	Owner occupied	Private rented	Social	Total
Database	36,543	5,356	7,320	49,219
2011 Census	33,393	5,332	6,656	45,381

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



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



4 Results from the BRE Dwelling Level Housing Stock Models and Database

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 database. 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 West Lancashire. Information at ward level, however, is provided in the maps, in **Section 4.2.4** and can also be obtained from the database which has been supplied as part of this project (see **Appendix C** for instructions). The database 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 West Lancashire. The results are then displayed in the following sub-sections:

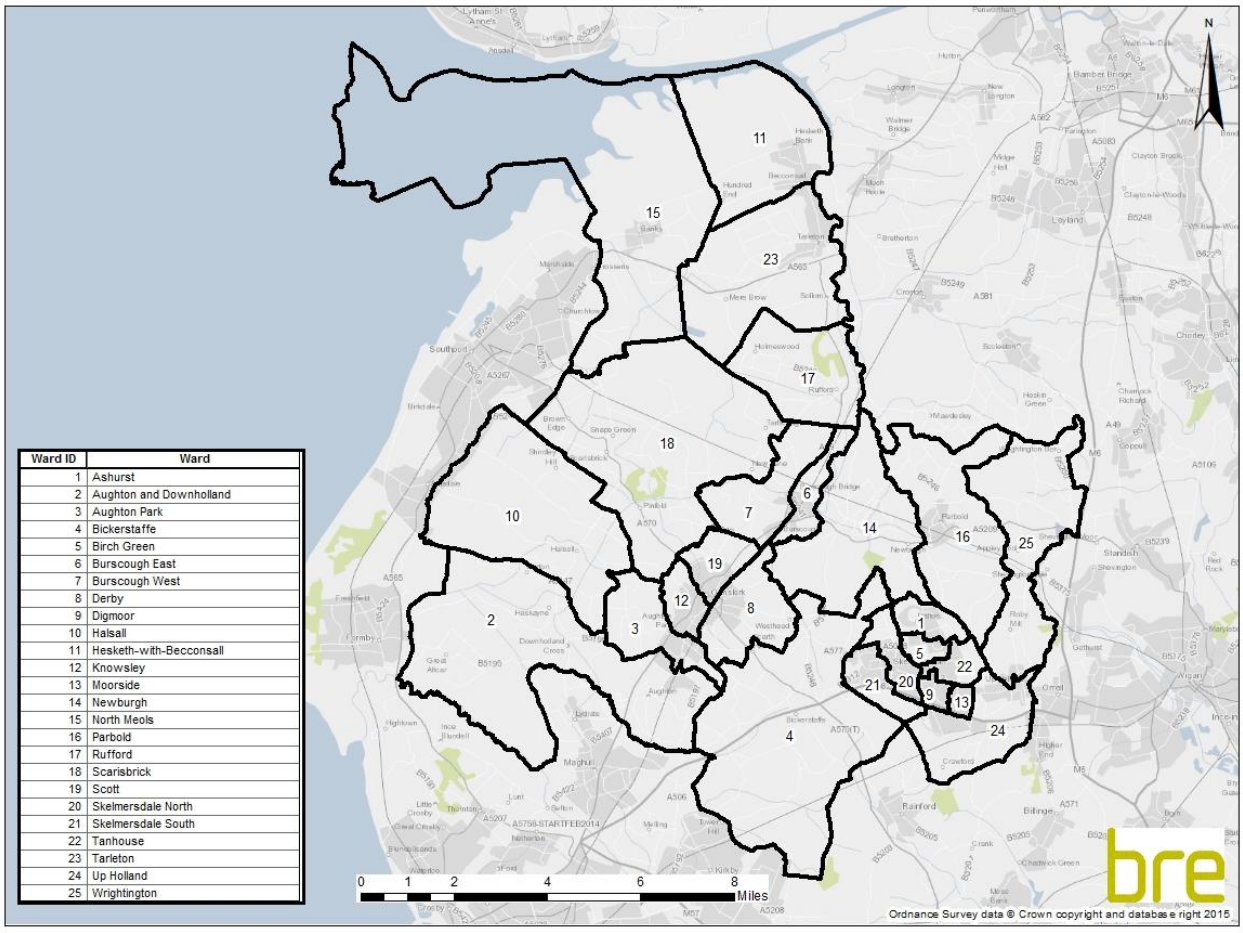
- Key indicators:
  - West Lancashire – regional and national comparisons
  - Key indicators by tenure for West Lancashire
  - Key indicators mapped by COA for West Lancashire private sector stock
  - Ward level results for the key indicators
  - Comparison with the results of the BRE 2014 Housing Stock Model

- Information relating to LAHS reporting and EPC ratings:
  - Cost of mitigating category 1 hazards
  - EPC ratings

4.1 Overview of West Lancashire

Map 3 below shows the 30 wards in West Lancashire. 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.

Map 3: The wards in West Lancashire



Ward ID	Ward
1	Ashurst
2	Aughton and Downholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-with-Becconsall
12	Knowsley
13	Moorside
14	Newburgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

4.2 Key indicators

4.2.1 West Lancashire – regional and national comparisons

Table 2 and **Figure 3** show the results for each of the key indicators in West Lancashire compared to North West and England (EHS 2012) and split into all stock and private sector stock. **Figure 4** shows the results of the SimpleSAP ratings.

For all stock, West Lancashire performs better than the EHS average for the following indicators: fall hazards (7% compared to 9%), fuel poverty (LIHC definition) (9% compared to 11%), low income households (19% compared to 33%). West Lancashire performs the same as the EHS average for fuel poverty (10% definition), slightly worse for disrepair (6% compared to 5%) and worse for all hazards (18% compared to 15%) and excess cold (10% compared to 6%). For a list of all the hazards included under "all hazards" see **Appendix A.** Since excess cold is one of the most commonly occurring hazards and there are comparatively high levels in West Lancashire, it is likely that this hazard is contributing to the higher levels of "all hazards".

For the private sector stock, West Lancashire performs better than the EHS average for fall hazards (8% compared to 10%), fuel poverty (LIHC definition) (10% compared to 11%) and low income households (10% compared to 24%). The levels of excess cold are higher in West Lancashire compared to the EHS average (11% compared to 7%) and this in part contributes to the higher levels of hazards overall in West Lancashire.

Compared to the regional figures for EHS North West, the most notable indicators are excess cold where West Lancashire performs worse for both all stock and private sector stock and low income households where West Lancashire performs better.

The average SimpleSAP ratings in West Lancashire (**Figure 4**) are slightly lower than those for the England average for all stock and the same for private sector stock. It is not unusual for urban areas to perform better than the country as a whole due to greater number of flats, which are more energy efficient due to reduced heat loss areas, and due to the greater likelihood of being on gas, a more efficient heating fuel.

Table 2: Estimates of the numbers and percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – West Lancashire compared to the North West and England (EHS 2012)

Indicator		All stock				Private sector stock			
		West Lancashire (no.)	West Lancashire (%)	2012 EHS Regional (%)	2012 EHS England (%)	West Lancashire (no.)	West Lancashire (%)	2012 EHS Regional (%)	2012 EHS England (%)
No. of dwellings		49,219	-	-	-	41,899	-	-	-
HHSRS category 1 hazards	All hazards	8,629	18%	14%	15%	8,121	19%	16%	17%
	Excess cold	4,892	10%	4%	6%	4,598	11%	5%	7%
	Fall hazards	3,286	7%	8%	9%	3,155	8%	9%	10%
Disrepair		2,839	6%	8%	5%	2,614	6%	9%	6%
Fuel poverty (10%)		7,512	15%	16%	15%	6,669	16%	16%	15%
Fuel poverty (Low Income High Costs)		4,559	9%	11%	11%	4,023	10%	12%	11%
Low income households		9,215	19%	23%	33%	4,300	10%	14%	24%

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 meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – West Lancashire compared to North West and England (EHS 2012)

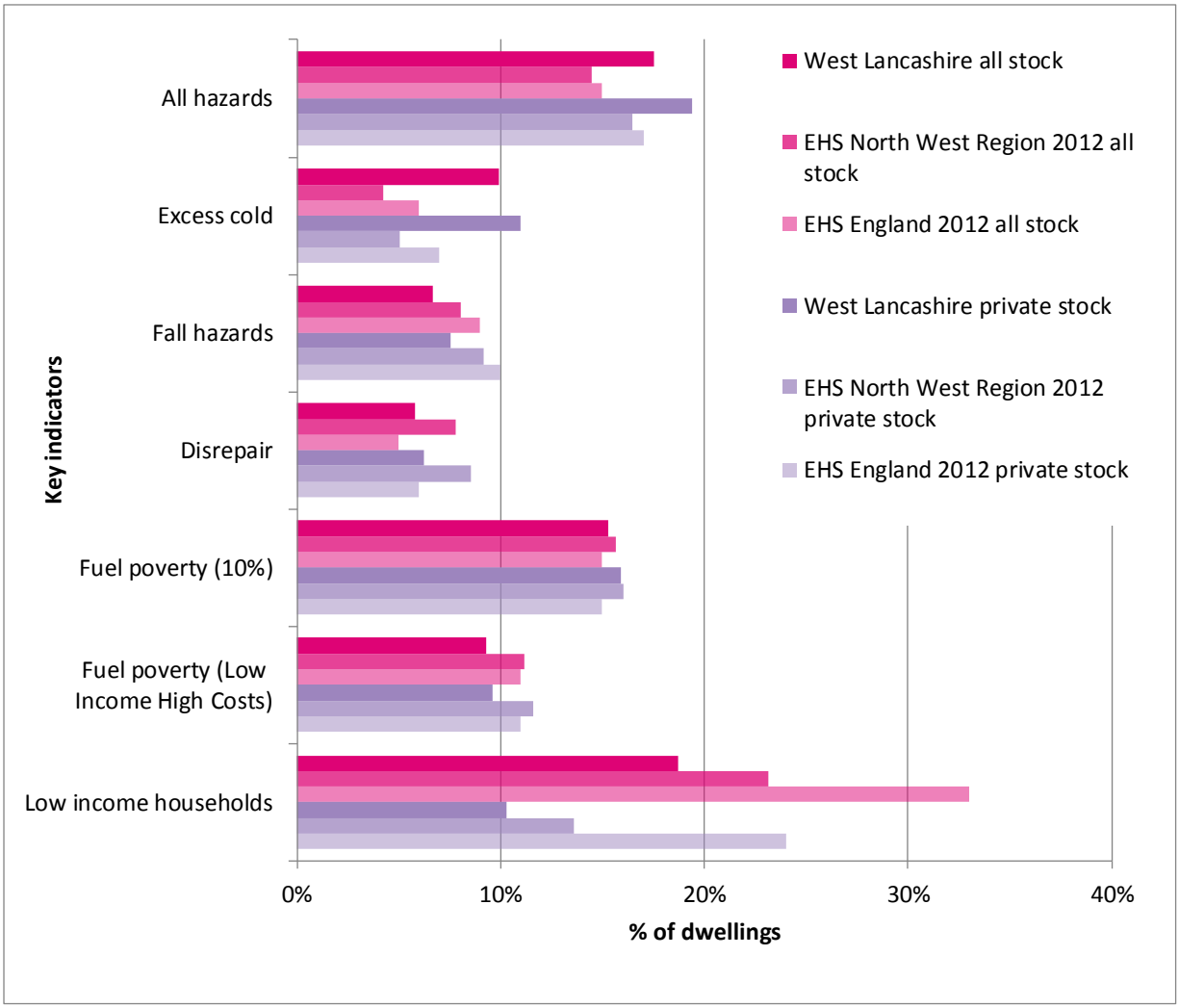
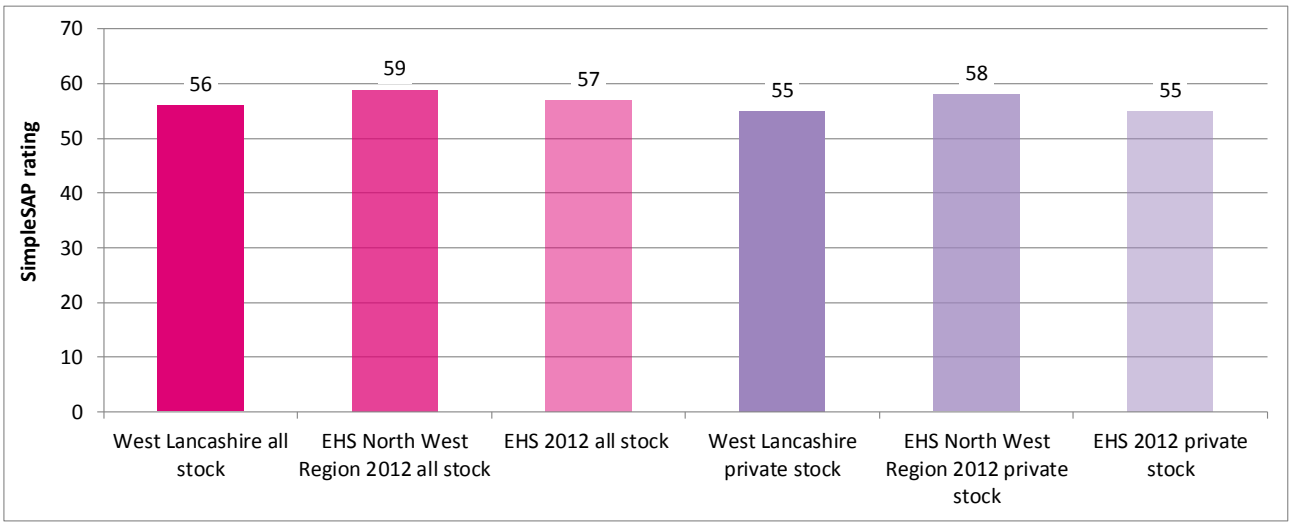


Figure 4: Average SimpleSAP ratings for all stock and private sector stock – West Lancashire compared to North West and England (EHS 2012)



4.2.2 Key indicators by tenure – West Lancashire

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 3** and **Figure 5** below show the results for each of the key indicators split by tenure and **Figure 6** shows the SimpleSAP ratings by tenure. It is interesting to note that the private rented sector has a slightly higher average SimpleSAP rating than the owner occupied sector, which may be due to more flats being in the private rented sector – which generally have better SimpleSAP ratings due to the lower external surface area.

The social stock is generally better than the private sector stock for the indicators relating to hazards, disrepair and energy efficiency (SimpleSAP). Social stock tends 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 generally worse than the private sector stock for the low income households indicator. Using the low income high cost definition of fuel poverty, private rented stock is considerably higher than that of owner occupied or social stock.

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 private rented stock is generally worse than the owner occupied stock with the exception of excess cold hazards and energy efficiency (SimpleSAP). The private rented stock is considerably worse than the owner occupied stock for the indicators of fuel poverty (LIHC definition) and low income households.

Table 3: Estimates of the numbers and percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database by tenure for West Lancashire

Indicator		Private sector stock				Social stock	
		Owner occupied		Private rented			
		No.	%	No.	%	No.	%
No. of dwellings		36,543	-	5,356	-	7,320	-
HHSRS category 1 hazards	All hazards	7,071	19%	1,050	20%	508	7%
	Excess cold	4,103	11%	495	9%	294	4%
	Fall hazards	2,694	7%	461	9%	131	2%
Disrepair		2,122	6%	492	9%	225	3%
Fuel poverty (10%)		5,722	16%	947	18%	843	12%
Fuel poverty (Low Income High Costs)		3,013	8%	1,010	19%	536	7%
Low income households		2,856	8%	1,444	27%	4,915	67%

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 meeting the key indicator criteria assessed by the Housing Stock Models and Database by tenure for West Lancashire

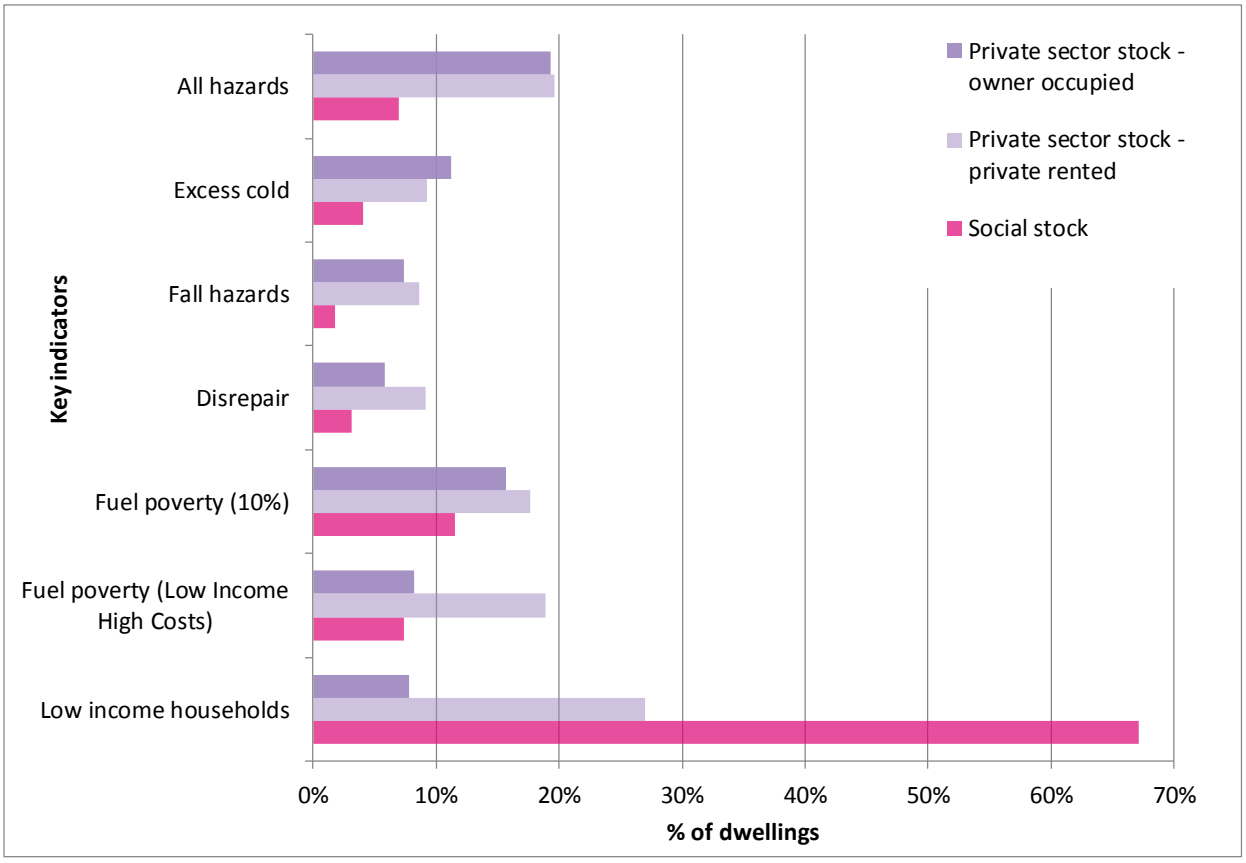
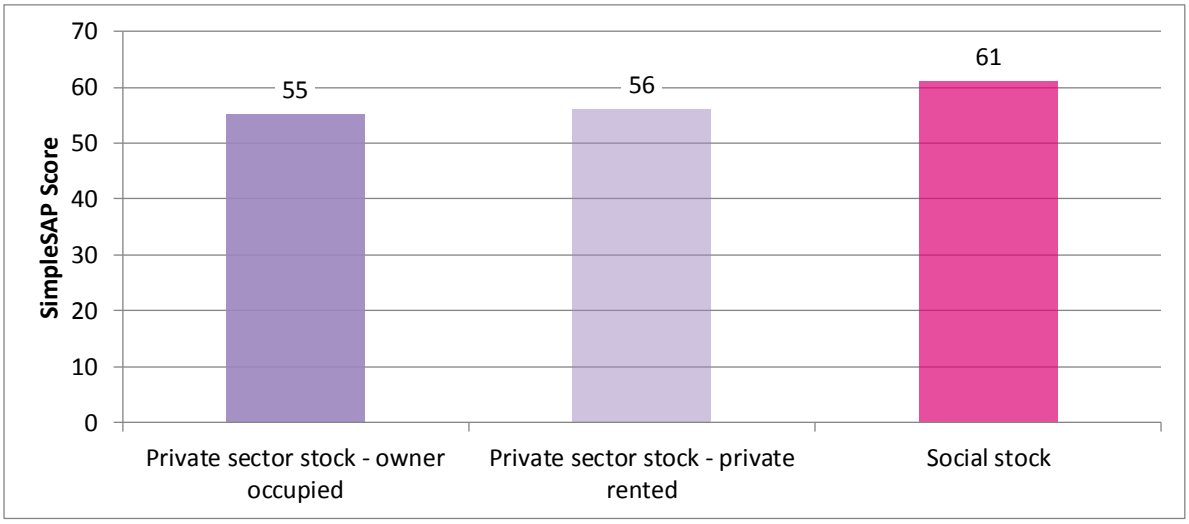


Figure 6: Average SimpleSAP ratings by tenure for West Lancashire



4.2.3 Key indicators mapped by Census Output Area (COA) – West Lancashire private sector stock

Some of the key indicators are also provided in map form below along with a brief description of each indicator[26], 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 key indicators.

The ranges shown in the map keys are defined based on the Jenks' Natural Breaks algorithm of the COA statistics[27]. 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 key indicators in **Maps 4** to **12** below:

- 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 fuel poverty
- Dwellings occupied by low income households
- Dwellings with a category 1 excess cold hazard that are occupied by a low income household
- The average SimpleSAP[28] rating

[26] See Appendix A for full definitions.

[27] 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.

Maps are also provided in **Appendix D** which focus in on the more urban areas of Skelmersdale and Ormskirk.

These maps are extremely useful in showing the geographical distribution for single key indicators. Maps can also be produced for a combination of indicators, such as dwellings with an excess cold hazard which are also occupied by low income households, as shown in **Map 11**.

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, it can be seen that each ward is split into several COAs and, in this instance, there are 30 COAs that have 52 - 82% 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 2004[6] 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 being category 1 (serious) or category 2 (other)[29].

The HHSRS map (**Map 4**) shows that there are concentrations of high levels of hazards in Newburgh, Scarisbrick and Bickerstaffe wards. There are also high concentrations in Halsall. **Map D 1** shows that the urban areas of Skelmersdale and Ormskirk tend to have lower concentrations of hazards. It is reasonable to expect that areas with greater numbers of older properties will record higher levels of hazards overall due to the contribution of greater numbers of excess cold and falls hazards.

There are relatively high levels of excess cold hazards in West Lancashire overall, with the highest concentrations in the more rural wards of Newburgh, Scarisbrick and Bickerstaffe– see **Map 5**. Again, **Map D 2** shows that the urban areas of Ormskirk and Skelmersdale tend to be less affected by excess cold hazards.

The highest concentrations of fall hazards are found in the wards of Bickerstaffe, Moorside and Newburgh. **Map D 3** zooms in on the more urban areas and shows that within the Moorside ward the highest levels of fall hazards are to the north and west of the ward. There are also higher levels to the east of Digmoor ward, central COAs within the Tanhouse ward as well as some of the COAs in the central areas of Ormskirk.

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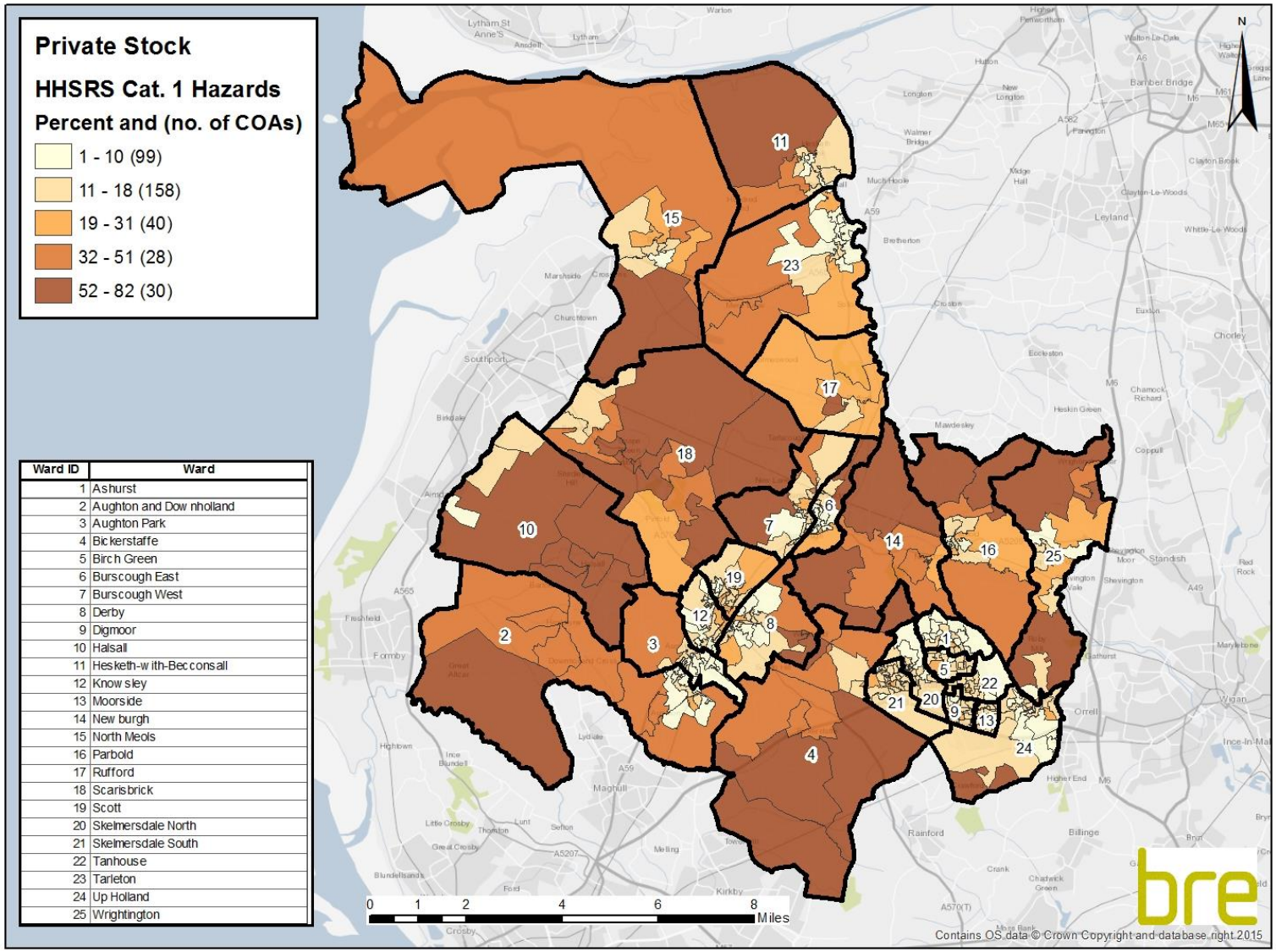
[28] Important note: Whilst it is possible to provide “SimpleSAP” ratings from the “SimpleCO_2” software, under no circumstances must these be referred to as “SAP” as the input data is insufficient to produce an estimate of SAP or even RdSAP for an individual dwelling that meets the standards required by these methodologies.

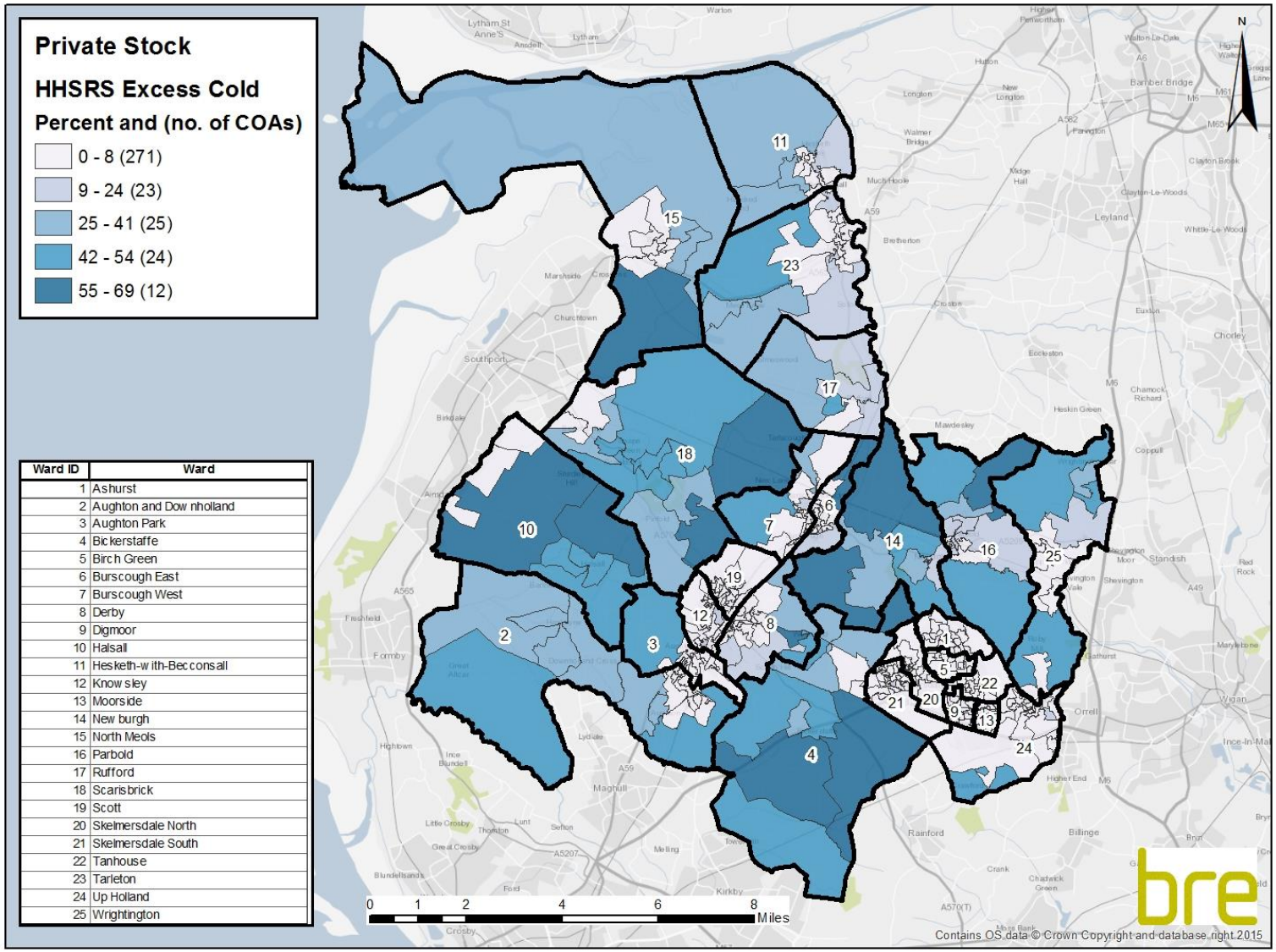
[29] Housing Health and Safety Rating System Operating Guidance, ODPM, 2006

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



Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

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



Ward ID	Ward
1	Ashurst
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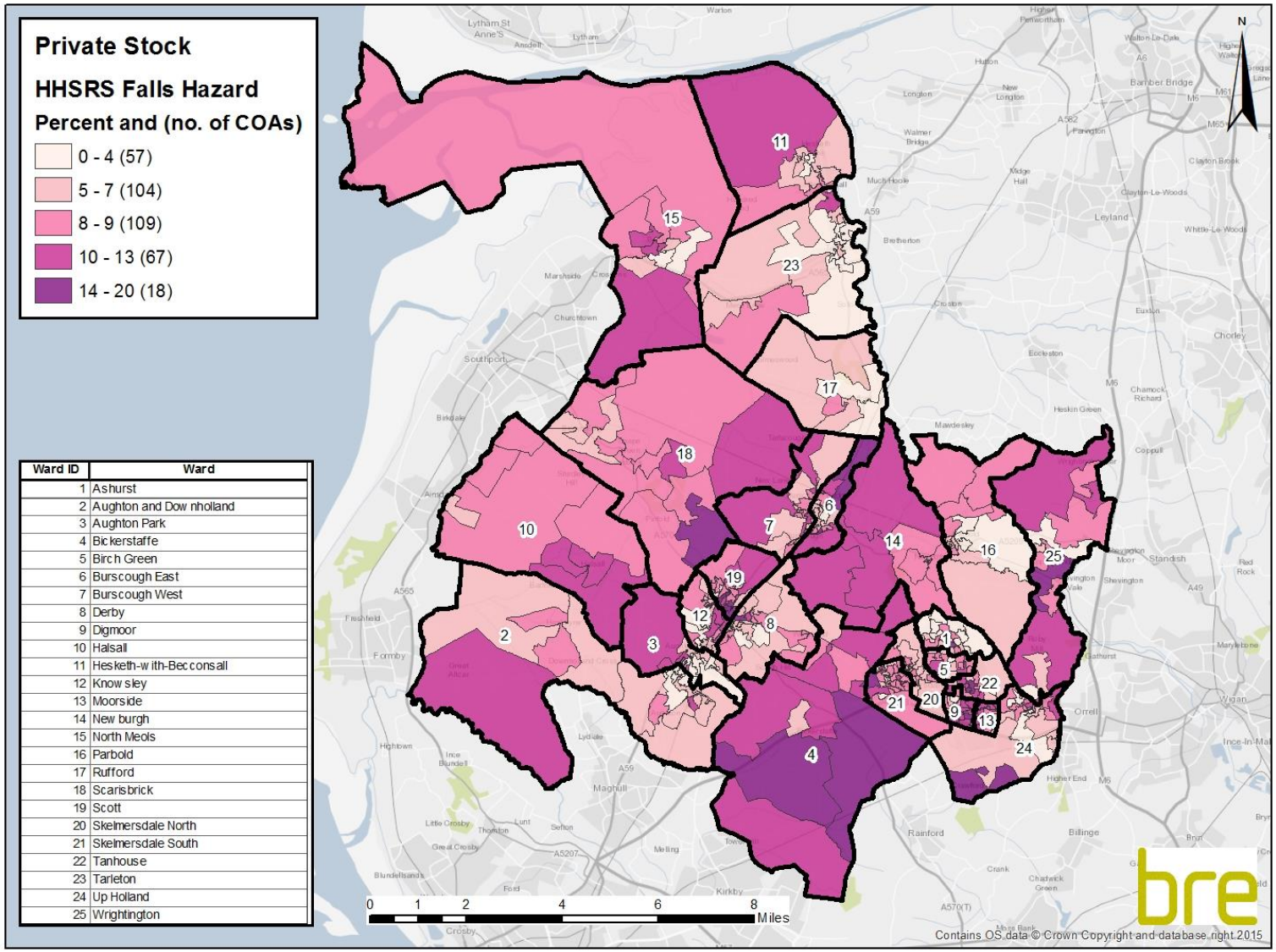
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

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



Ward ID	Ward
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25	Wrightington

4.2.3.2 Disrepair

The disrepair indicator used in this report is based on the disrepair component of the Decent Homes Standard[30,31]. 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 stat of repair.

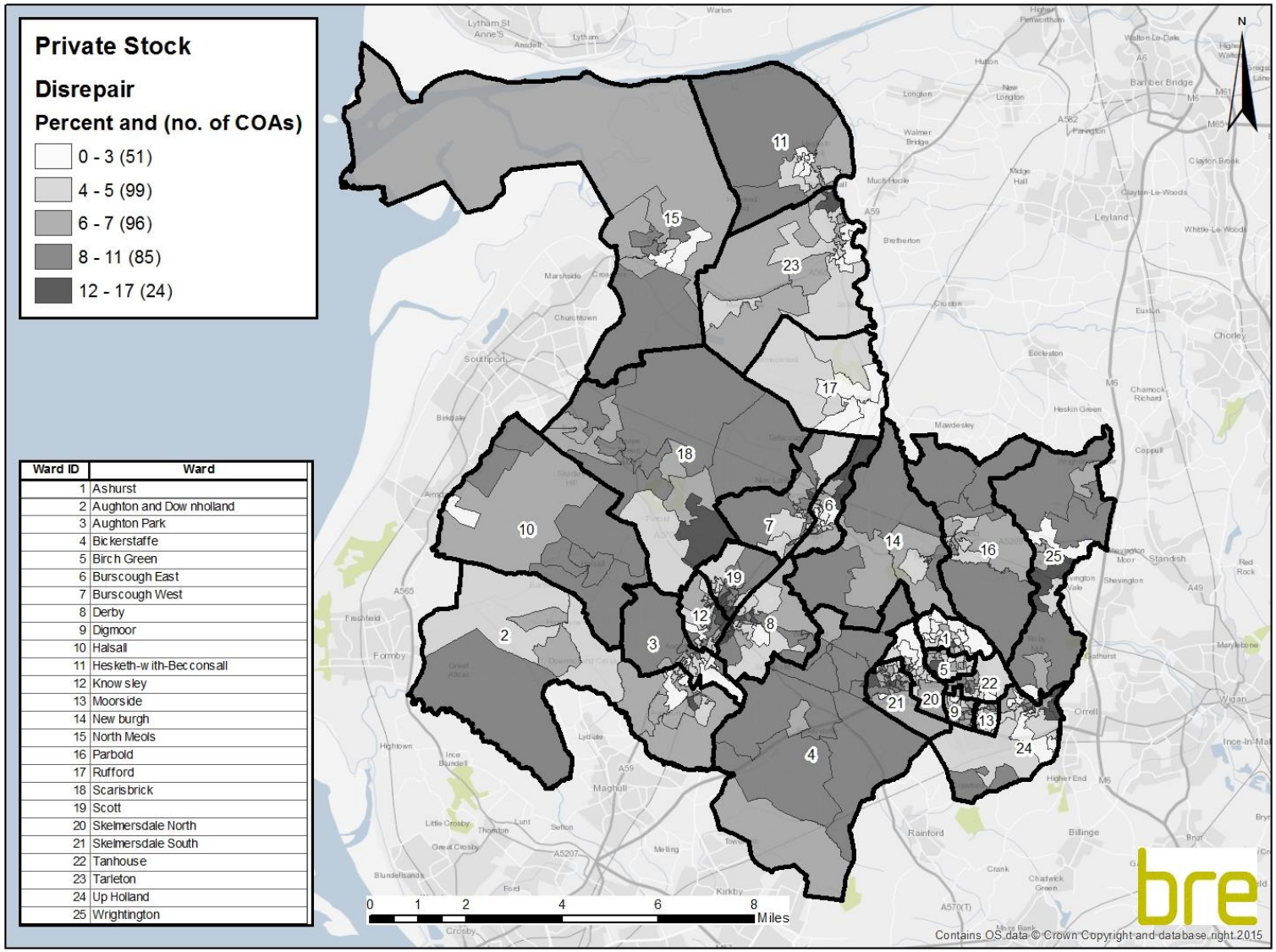
Other building components are those that have a less immediate impact on the integrity of the dwelling. Their combined effect is therefore considered, with a dwelling failing the disrepair standard if two or more elements are old and need replacing or require immediate major repair.

Map 7 shows the distribution of dwellings estimated to be in disrepair in West Lancashire. Bickerstaffe, Scarisbrick and Scott are the wards with the overall highest levels of dwellings in disrepair, although there are other areas distributed across the area. **Map D 4** zooms in on the urban areas and shows that there are pockets of COAs with higher levels of dwellings in disrepair in Skelmersdale (e.g. to the west of Birch Green). There is also a clear concentration of COAs with higher levels in the central COAs of Ormskirk (e.g. to the south of Scott, the east of Knowsley and the south west of Derby wards).

[30] https://www.gov.uk/government/publications/a-decent-home-definition-and-guidance

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

Map 7: Percentage of private sector dwellings in West Lancashire in disrepair



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12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
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24	Up Holland
25	Wrightington

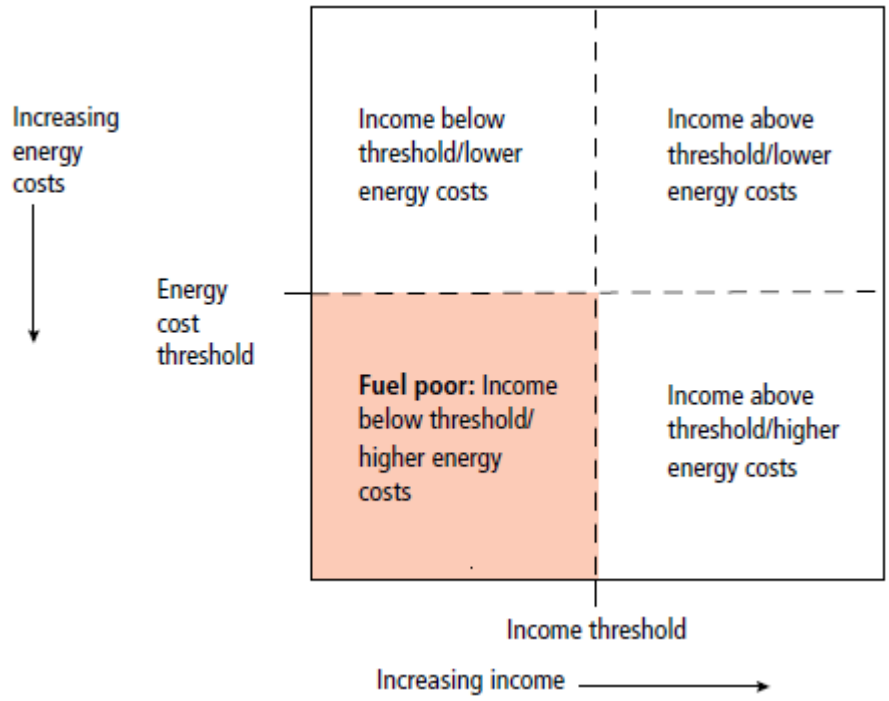
4.2.3.3 Fuel poverty

This report covers both the original definition and the new definition of fuel poverty which is currently being rolled out by government.

The original 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 (defined as 21°C for the main living area, and 18°C for other occupied rooms in the 2012 Hills Fuel Poverty Review)[32]. For the purposes of this report this is termed "fuel poverty (10%)".

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) 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 (Low Income High Costs)".

Figure 7: A representation of the Low Income High Costs definition of fuel poverty[32]



A report produced by DECC[33] states that under the 10% fuel poverty indicator, increasing household income potentially removes households from fuel poverty as they will be spending a smaller proportion of their income on fuel. Reducing income has the opposite effect potentially pushing households into fuel poverty. Decreasing fuel prices and/or improvements made to the energy efficiency of the home can remove households from fuel poverty, while rising prices will have the opposite effect.

[32] Hills, J. Getting the measure of fuel poverty - Final Report of the Fuel Poverty Review, London: LSE., 2012

[33] Fuel Poverty Report – Updated August 2013, Department of Energy and Climate Change, 2013

As the low income high cost indicator is a relative measure, it provides a much steadier trend in the number of fuel poor households over time than the 10% indicator. Whereas an increase in income is likely to reduce the extent of fuel poverty under the 10% definition, under the low income high cost indicator, 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.

The 10% indicator tends to be very responsive to changes in prices, such that these usually dominate the indicator, outweighing other factors such as income and energy efficiency.

Map 8 shows that, based on the fuel poverty 10% definition, the highest concentrations tend to be in the more rural areas, in particular the wards of Bickerstaffe, Scarisbrick and Newburgh. **Map D 5** zooms in on the urban areas and shows that there are COAs with higher concentrations of fuel poverty in the Skelmersdale areas but less so in Ormskirk.

For comparison, **Map 9** shows the results based on the fuel poverty Low Income High Costs definition, whilst the overall pattern is similar, analysis of the data behind the maps shows that the highest concentrations are in the Digmoor, Moorside and Skelmersdale South wards. **Map D 6** provides a more detailed picture of the urban areas in West Lancashire.

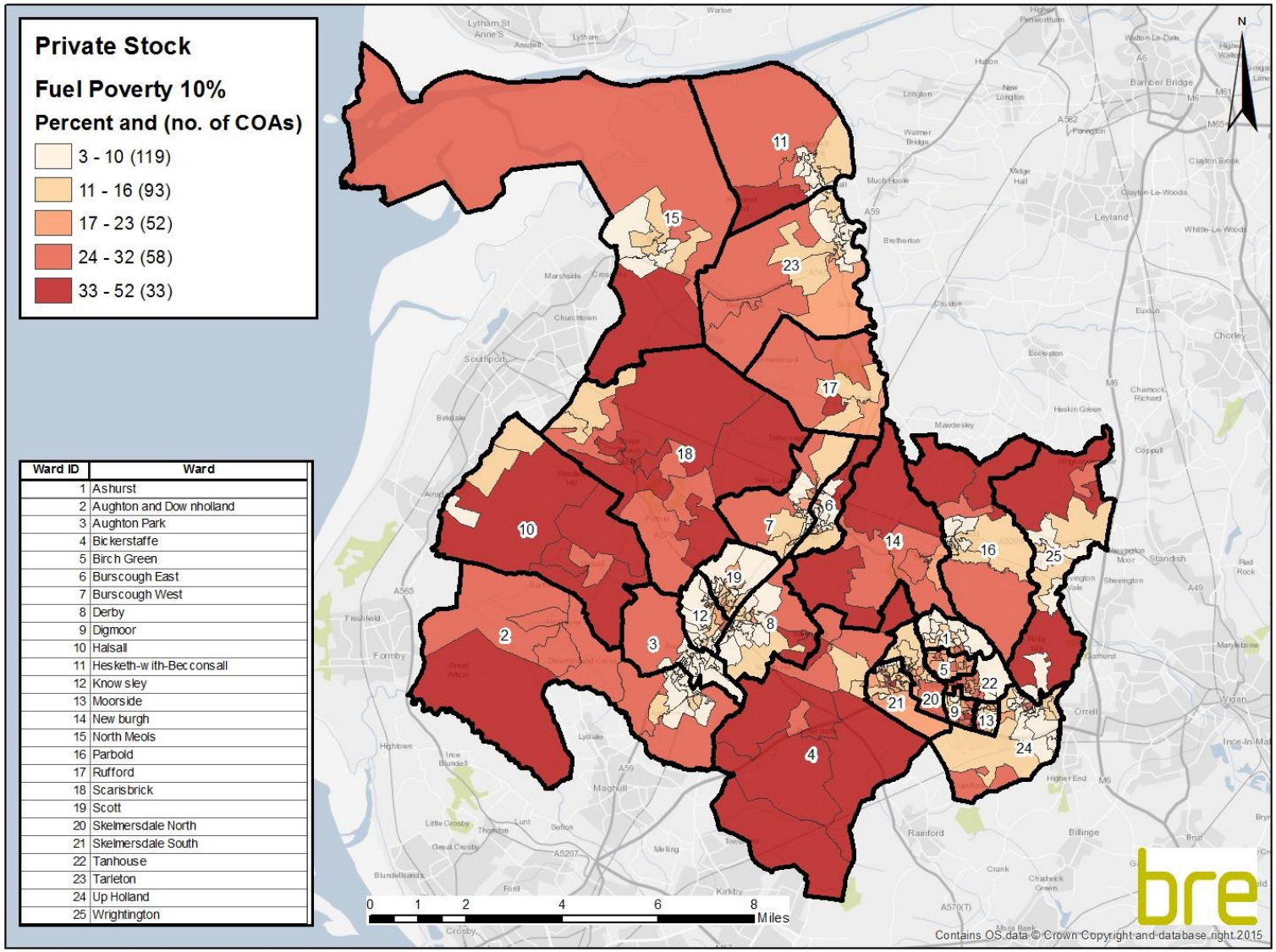
4.2.3.3.1 What type of property is in fuel poverty under the Low Income High Costs Definition?

The Hills Fuel Poverty Review[32] provides useful figures that show the likely composition of a fuel poor household under this definition:

- 76% of fuel poor households have an EPC rating of E to G
- 20% of fuel poor households are rural
- 82% of fuel poor households live in houses as opposed to flats or bungalows
- A third of fuel poor households are found in a fifth of the most deprived households
- Fuel poverty is spread fairly evenly between regions, including London
- 34% of fuel poor households contain a person with a long term illness or disability
- 10% of fuel poor households contain a person over the age of 75
- 20% of fuel poor households contain a person under the age of 5

These figures should be considered when analysing the map showing the percentage of private sector dwellings in West Lancashire occupied by households in fuel poverty under the Low Income High Costs definition.

Map 8: Percentage of private sector dwellings in West Lancashire occupied by households in fuel poverty - 10% definition



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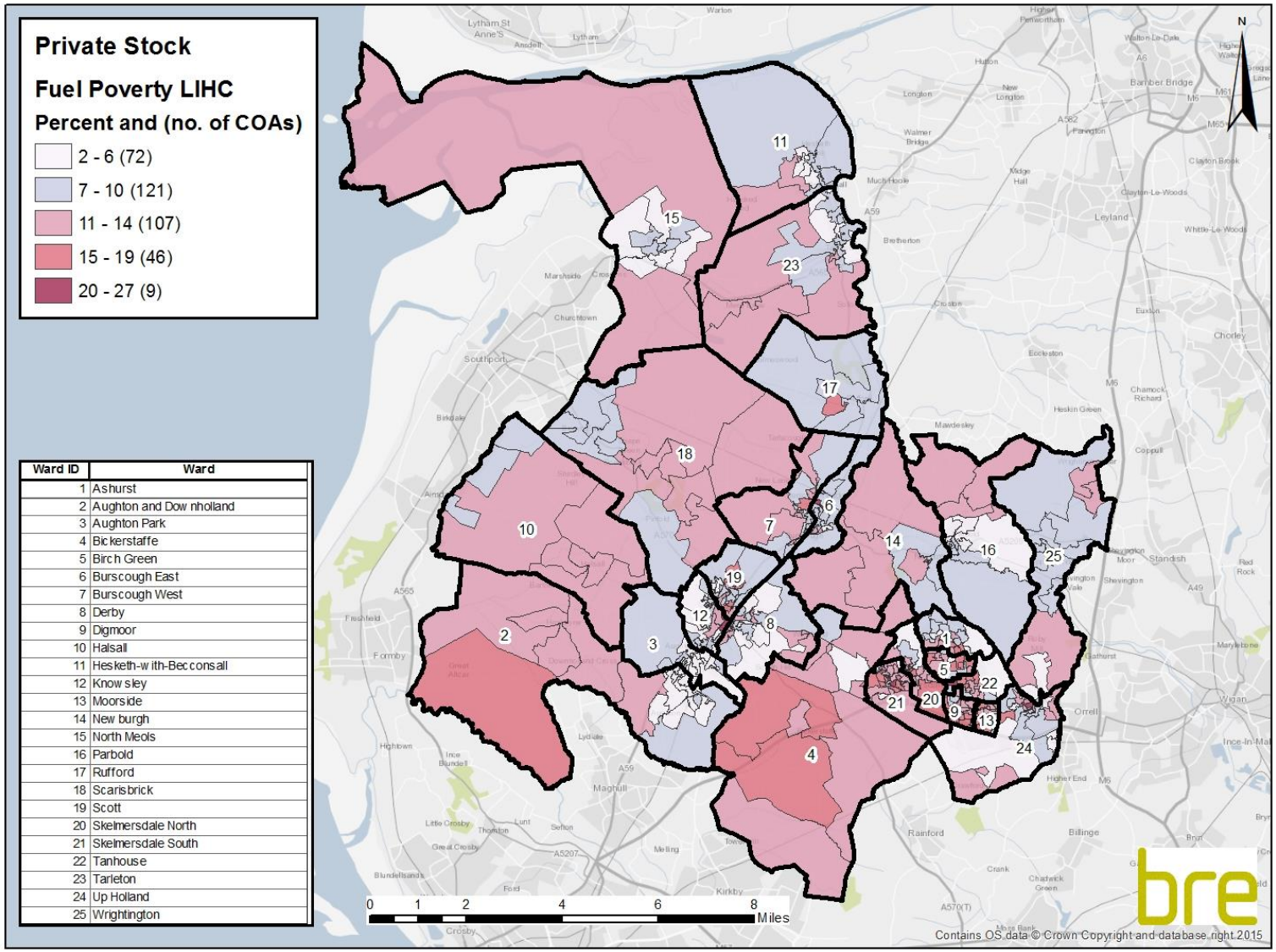
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

Map 9: Percentage of private sector dwellings in West Lancashire occupied by households in fuel poverty – Low Income High Costs definition



Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

4.2.3.4 Low income households

A low income household is defined as 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

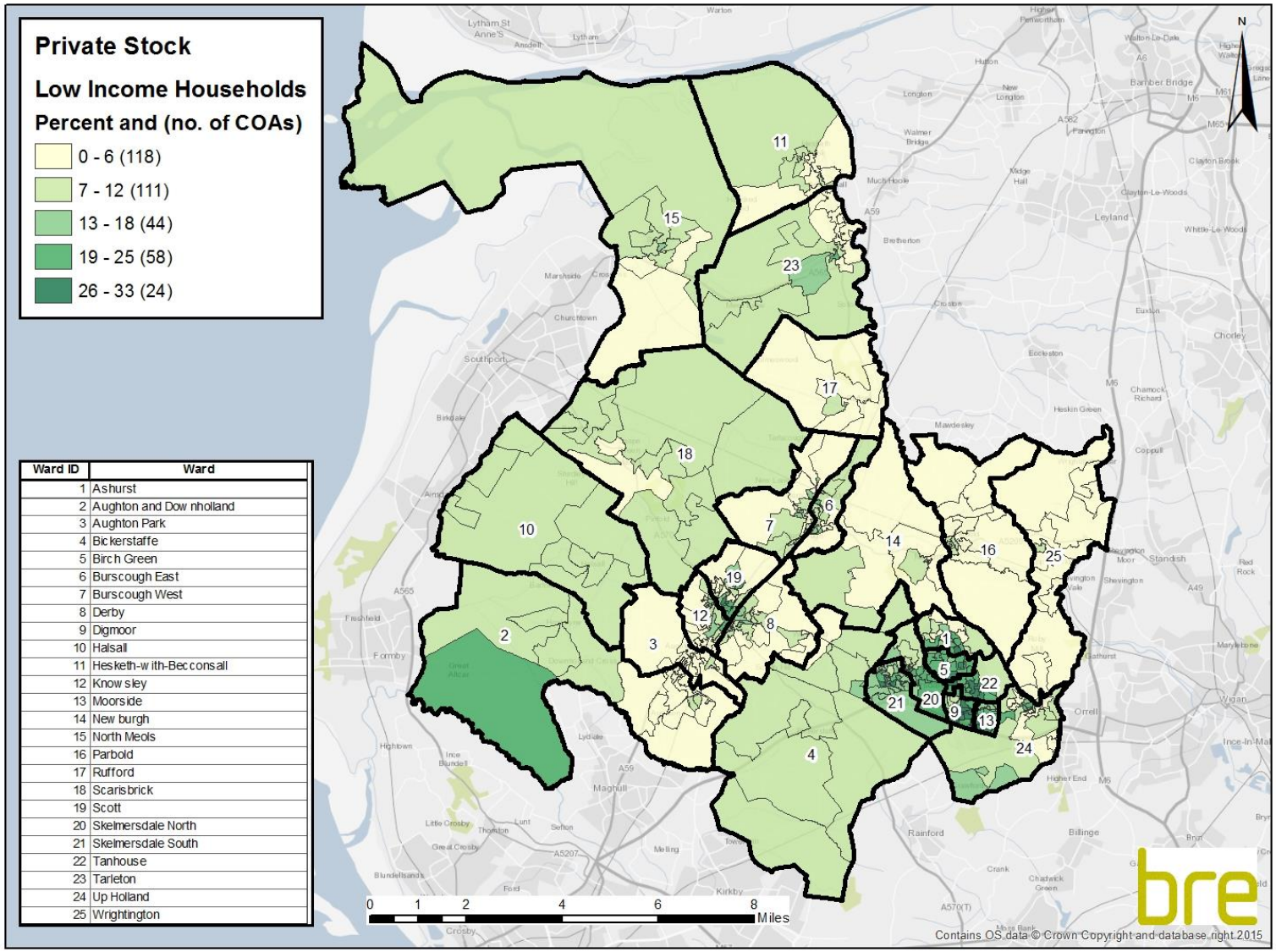
For child tax credit and working tax credit, the household is only considered a low income household if it has a relevant income of less than £15,050.

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

Map 10 shows that concentrations of low income households tend to be concentrated in the urban area of Skelmersdale and, to a lesser extent, Ormskirk. There is also one COA with higher concentrations to the south of Aughton and Downholland ward. The data behind the maps shows that the wards with the highest levels of low income households are Digmoor, Moorside and Birch Green. **Map D 7** zooms in on these wards within Skelmersdale and shows that the highest levels are across the central band of COAs in Digmoor ward, to the south west of Moorside and to the south of Birch Green. There are also a number of COAs with high levels of low income households to the west of Tanhouse ward.

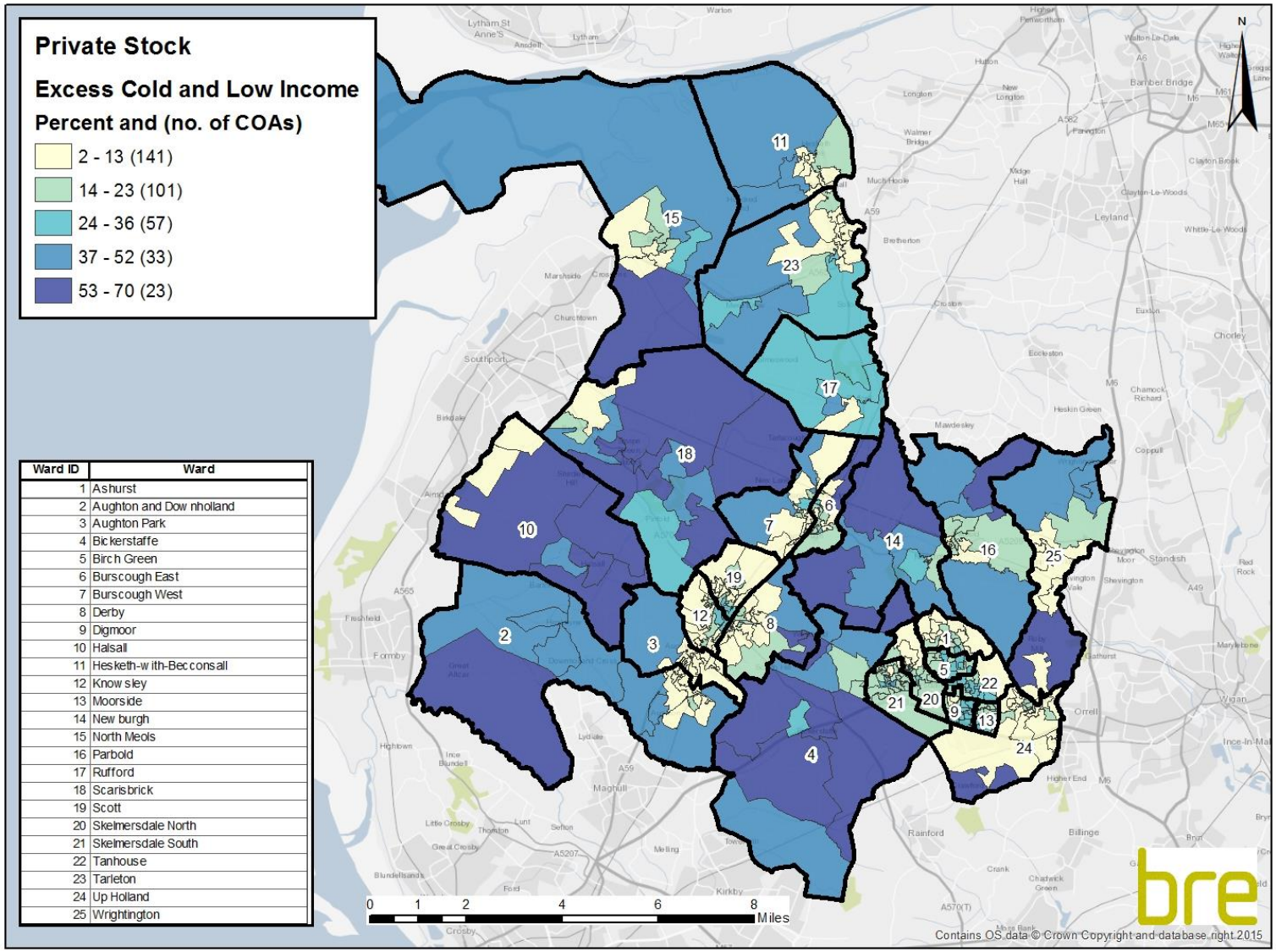
Map 11 provides an additional layer of information, with the data for low income households being combined with HHSRS excess cold data. This provides a vital picture of where vulnerable people are likely to be living in poor housing. The map indicates that the distribution shows higher levels being seen in the more rural areas of West Lancashire. **Map D 8** zooms in on the urban areas of Skelmersdale and Ormskirk.

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



Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

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



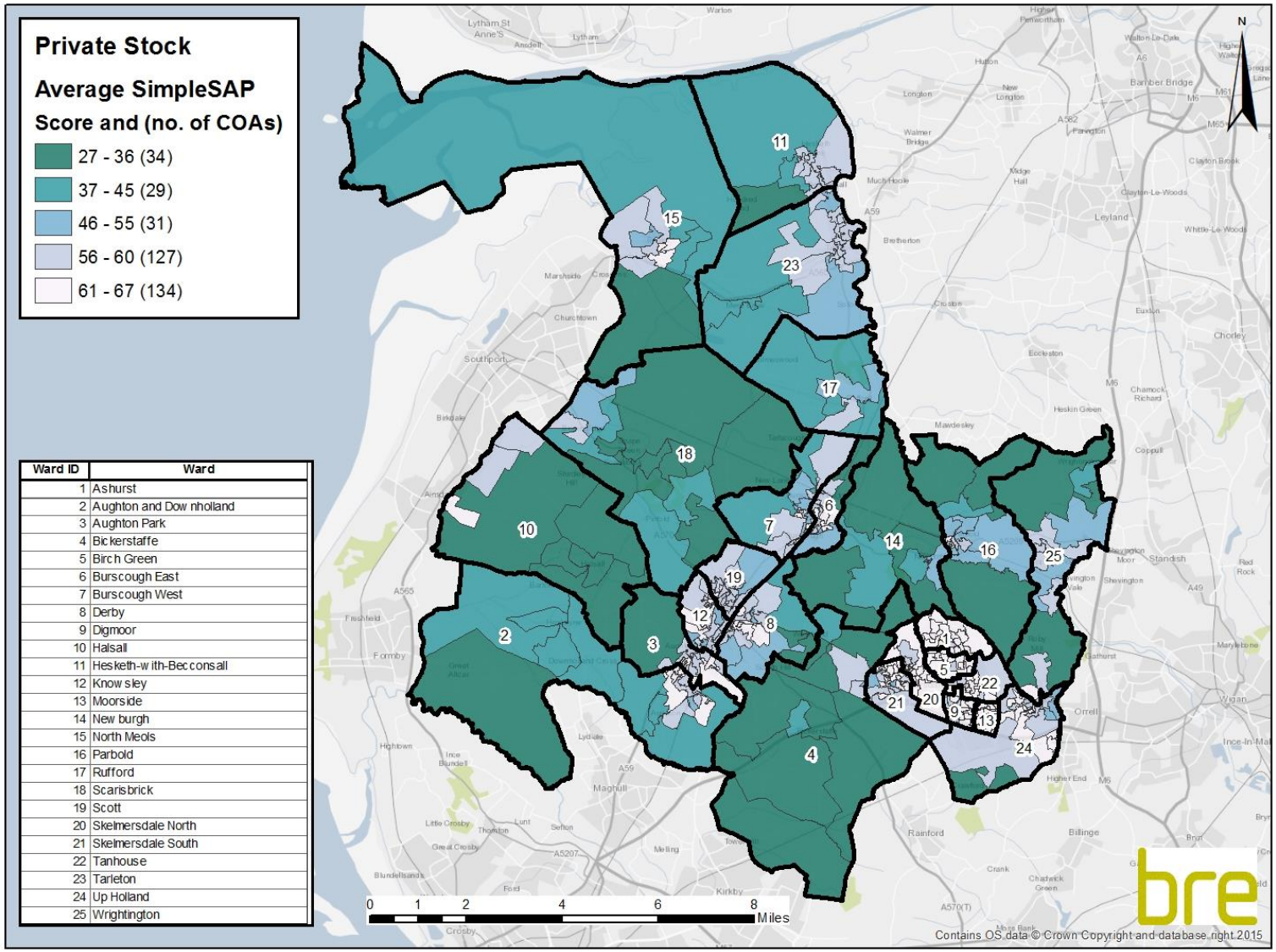
Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

4.2.3.5 SimpleSAP

The average SimpleSAP map (**Map 12**) shows that areas with lower average SimpleSAP ratings are scattered across the area but are mainly in the more rural parts. The data behind the maps shows that the wards with the poorest SimpleSAP scores are Newburgh, Bickerstaffe and Scarisbrick. **Map D 9** provides more information on the urban areas of West Lancashire.

Low SimpleSAP scores can be found in areas which include 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 West Lancashire private sector stock



Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
3	Aughton Park
4	Bickerstaffe
5	Birch Green
6	Burscough East
7	Burscough West
8	Derby
9	Digmoor
10	Halsall
11	Hesketh-w ith-Becconsall
12	Know sley
13	Moorside
14	New burgh
15	North Meols
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18	Scarisbrick
19	Scott
20	Skelmersdale North
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22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

4.2.4 Ward level results for the key indicators – total stock and private sector stock

The previous maps have provided a visual representation of the key indicators at Census Output Area (COA) level. The following tables provide the complete set of figures at ward level for the key indicators; firstly, for the total stock (**Table 4**) and secondly, for the private sector stock (**Table 5**). This allows a direct comparison between the wards in West Lancashire.

Table 4: *Total stock* – number and percentage of dwellings failing each of the key indicators, 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		
Ashurst	2,598	184 (7%)	24 (1%)	117 (5%)	76 (3%)	278 (11%)	225 (9%)	625 (24%)	64
Aughton and Downholland	2,436	521 (21%)	376 (15%)	142 (6%)	138 (6%)	342 (14%)	175 (7%)	213 (9%)	52
Aughton Park	1,702	171 (10%)	76 (4%)	91 (5%)	83 (5%)	140 (8%)	90 (5%)	87 (5%)	59
Bickerstaffe	888	391 (44%)	336 (38%)	96 (11%)	75 (8%)	257 (29%)	109 (12%)	114 (13%)	39
Birch Green	1,853	181 (10%)	21 (1%)	98 (5%)	82 (4%)	292 (16%)	182 (10%)	805 (43%)	63
Burscough East	1,880	259 (14%)	123 (7%)	125 (7%)	87 (5%)	207 (11%)	164 (9%)	322 (17%)	58
Burscough West	2,135	367 (17%)	208 (10%)	151 (7%)	137 (6%)	276 (13%)	205 (10%)	262 (12%)	55
Derby	2,734	447 (16%)	238 (9%)	190 (7%)	207 (8%)	346 (13%)	214 (8%)	363 (13%)	56
Digmoor	2,011	212 (11%)	33 (2%)	123 (6%)	98 (5%)	353 (18%)	232 (12%)	897 (45%)	62
Halsall	925	379 (41%)	324 (35%)	79 (9%)	74 (8%)	247 (27%)	99 (11%)	91 (10%)	42
Hesketh-with-Becconsall	1,765	342 (19%)	215 (12%)	110 (6%)	90 (5%)	229 (13%)	137 (8%)	143 (8%)	54
Knowsley	2,648	345 (13%)	101 (4%)	200 (8%)	201 (8%)	322 (12%)	219 (8%)	308 (12%)	58
Moorside	1,705	189 (11%)	11 (1%)	127 (7%)	89 (5%)	281 (16%)	212 (12%)	632 (37%)	63
Newburgh	929	429 (46%)	387 (42%)	91 (10%)	68 (7%)	264 (28%)	99 (11%)	66 (7%)	38
North Meols	1,947	424 (22%)	263 (14%)	136 (7%)	111 (6%)	269 (14%)	136 (7%)	257 (13%)	54
Parbold	1,637	450 (27%)	372 (23%)	97 (6%)	106 (6%)	280 (17%)	124 (8%)	95 (6%)	48
Rufford	972	256 (26%)	217 (22%)	47 (5%)	28 (3%)	191 (20%)	93 (10%)	78 (8%)	48
Scarisbrick	1,729	781 (45%)	685 (40%)	155 (9%)	144 (8%)	504 (29%)	196 (11%)	170 (10%)	39

Table 4 cont.: *Total stock* – number and percentage of dwellings failing each of the key indicators, 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		
Scott	2,518	330 (13%)	51 (2%)	222 (9%)	207 (8%)	313 (12%)	245 (10%)	483 (19%)	58
Skelmersdale North	1,738	167 (10%)	13 (1%)	102 (6%)	71 (4%)	252 (14%)	178 (10%)	564 (32%)	62
Skelmersdale South	3,021	390 (13%)	81 (3%)	215 (7%)	200 (7%)	508 (17%)	368 (12%)	881 (29%)	60
Tanhouse	2,255	213 (9%)	35 (2%)	119 (5%)	93 (4%)	371 (16%)	222 (10%)	926 (41%)	63
Tarleton	2,590	385 (15%)	248 (10%)	111 (4%)	109 (4%)	348 (13%)	213 (8%)	232 (9%)	55
Up Holland	2,706	321 (12%)	126 (5%)	172 (6%)	137 (5%)	323 (12%)	254 (9%)	451 (17%)	59
Wrightington	1,897	495 (26%)	328 (17%)	170 (9%)	128 (7%)	319 (17%)	168 (9%)	150 (8%)	51

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 5: *Private sector stock* – number and percentage of dwellings for each of the key indicators, 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		
Ashurst	2,082	169 (8%)	21 (1%)	110 (5%)	65 (3%)	223 (11%)	193 (9%)	255 (12%)	63
Aughton and Downholland	2,268	494 (22%)	352 (16%)	140 (6%)	133 (6%)	324 (14%)	163 (7%)	117 (5%)	52
Aughton Park	1,656	169 (10%)	75 (5%)	90 (5%)	82 (5%)	138 (8%)	88 (5%)	68 (4%)	59
Bickerstaffe	835	375 (45%)	320 (38%)	95 (11%)	73 (9%)	249 (30%)	103 (12%)	85 (10%)	39
Birch Green	1,066	145 (14%)	11 (1%)	84 (8%)	59 (6%)	205 (19%)	130 (12%)	236 (22%)	63
Burscough East	1,613	246 (15%)	115 (7%)	122 (8%)	82 (5%)	180 (11%)	142 (9%)	141 (9%)	58
Burscough West	1,949	347 (18%)	192 (10%)	148 (8%)	132 (7%)	262 (13%)	190 (10%)	160 (8%)	55
Derby	2,460	432 (18%)	228 (9%)	186 (8%)	198 (8%)	326 (13%)	200 (8%)	213 (9%)	56
Digmoor	1,181	169 (14%)	23 (2%)	103 (9%)	69 (6%)	251 (21%)	169 (14%)	271 (23%)	61
Halsall	884	365 (41%)	310 (35%)	78 (9%)	73 (8%)	240 (27%)	95 (11%)	71 (8%)	42
Hesketh-with-Becconsall	1,693	333 (20%)	207 (12%)	110 (6%)	89 (5%)	224 (13%)	134 (8%)	109 (6%)	54
Knowsley	2,471	334 (14%)	95 (4%)	197 (8%)	194 (8%)	302 (12%)	205 (8%)	197 (8%)	58
Moorside	1,215	167 (14%)	7 (1%)	116 (10%)	73 (6%)	224 (18%)	175 (14%)	279 (23%)	63
Newburgh	894	419 (47%)	377 (42%)	90 (10%)	67 (7%)	260 (29%)	97 (11%)	52 (6%)	38
North Meols	1,811	415 (23%)	257 (14%)	134 (7%)	107 (6%)	258 (14%)	128 (7%)	167 (9%)	53
Parbold	1,602	443 (28%)	365 (23%)	97 (6%)	105 (7%)	277 (17%)	122 (8%)	81 (5%)	48
Rufford	914	239 (26%)	201 (22%)	46 (5%)	27 (3%)	183 (20%)	88 (10%)	52 (6%)	48
Scarisbrick	1,657	755 (46%)	660 (40%)	154 (9%)	142 (9%)	489 (30%)	187 (11%)	128 (8%)	39

Table 5 cont.: *Private sector stock* – number and percentage of dwellings for each of the key indicators, 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		
Scott	2,150	309 (14%)	42 (2%)	214 (10%)	190 (9%)	276 (13%)	216 (10%)	247 (11%)	58
Skelmersdale North	1,252	149 (12%)	9 (1%)	94 (8%)	59 (5%)	198 (16%)	148 (12%)	224 (18%)	62
Skelmersdale South	2,278	333 (15%)	49 (2%)	202 (9%)	171 (8%)	392 (17%)	302 (13%)	382 (17%)	60
Tanhouse	1,417	162 (11%)	14 (1%)	102 (7%)	67 (5%)	262 (18%)	161 (11%)	311 (22%)	63
Tarleton	2,465	372 (15%)	237 (10%)	110 (4%)	107 (4%)	337 (14%)	206 (8%)	158 (6%)	55
Up Holland	2,297	305 (13%)	120 (5%)	165 (7%)	125 (5%)	281 (12%)	222 (10%)	196 (9%)	58
Wrightington	1,789	475 (27%)	311 (17%)	168 (9%)	125 (7%)	308 (17%)	159 (9%)	100 (6%)	51

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.

4.2.5 Comparison with the results of the BRE 2014 Housing Stock Model

This section provides a brief comparison of the results between the previous 2014 Housing Stock Model and the new 2016 Model. **Table 6** compares the results for all stock and private sector stock and **Figure 8** shows this comparison as a chart. For all hazards, excess cold and disrepair the 2016 Model shows an increase in the proportion of dwellings affected compared to the 2014 Model. For falls, fuel poverty and low income households the 2016 Model shows a decrease compared to the 2014 Model.

The excess cold figures will be subject to change for a number of reasons:

- A new energy model (using the 2012 version of SAP instead of SAP 2009)
- The new cut off point for excess cold (SAP score of 33.5 or less) associated with the 2012 model (previously this was 31.5 under SAP 2009)
- Improved energy model inputs

The decrease in levels of low income households in West Lancashire is as a result of the same decrease in the latest EHS results.

The decrease in fuel poverty (10%) is partly due to lower figures for the private rented sector as a result of a decrease in the latest EHS figures.

Furthermore, the new Logistic Regression Model which was developed for the low income indicator also explains the changes in low income and fuel poverty (LIHC) between the 2014 and 2016 Models.

Figure 9 compares the average SimpleSAP estimates between the 2016 and 2014 Models. The average SimpleSAP estimates from the 2016 Model are slightly lower than those for the 2014 Model (56 compared to 58 for all stock and 55 compared to 57 for private stock). The reason for this is that the 2016 Model has been updated to use the new SAP 2012 calculation instead of the previous SAP 2009 calculation. The 2012 version of SAP will incorporate new technologies and improvements to heating and

insulation that can affect the energy use or costs of a home. It also incorporates improvements in the understanding of how buildings perform, updates to any assumptions made about buildings or occupant behaviour, and any new policy requirements with regard to SAP modelling.

Table 6: Estimates of the numbers and percentages of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – 2016 Model compared to 2014 Model

Indicator		All stock				Private sector stock			
		2016 Model (no.)	2016 Model (%)	2014 Model (no.)	2014 Model (%)	2016 Model (no.)	2016 Model (%)	2014 Model (no.)	2014 Model (%)
No. of dwellings		49,219	-	47,323	-	41,899	-	40,057	-
HHSRS category 1 hazards	All hazards	8,629	18%	6,177	13%	8,121	19%	5,813	15%
	Excess cold	4,892	10%	3,130	7%	4,598	11%	2,975	7%
	Fall hazards	3,286	7%	3,324	7%	3,155	8%	3,116	8%
Disrepair		2,839	6%	2,412	5%	2,614	6%	2,186	5%
Fuel poverty (10%)		7,512	15%	8,244	17%	6,669	16%	7,352	18%
Fuel poverty (Low Income High Costs)		4,559	9%	5,568	12%	4,023	10%	4,897	12%
Low income households		9,215	19%	15,278	32%	4,300	10%	9,494	24%

Figure 8: Estimates of the percentage of dwellings meeting the key indicator criteria assessed by the Housing Stock Models and Database for all stock and private sector stock – 2016 Model compared to 2014 Model

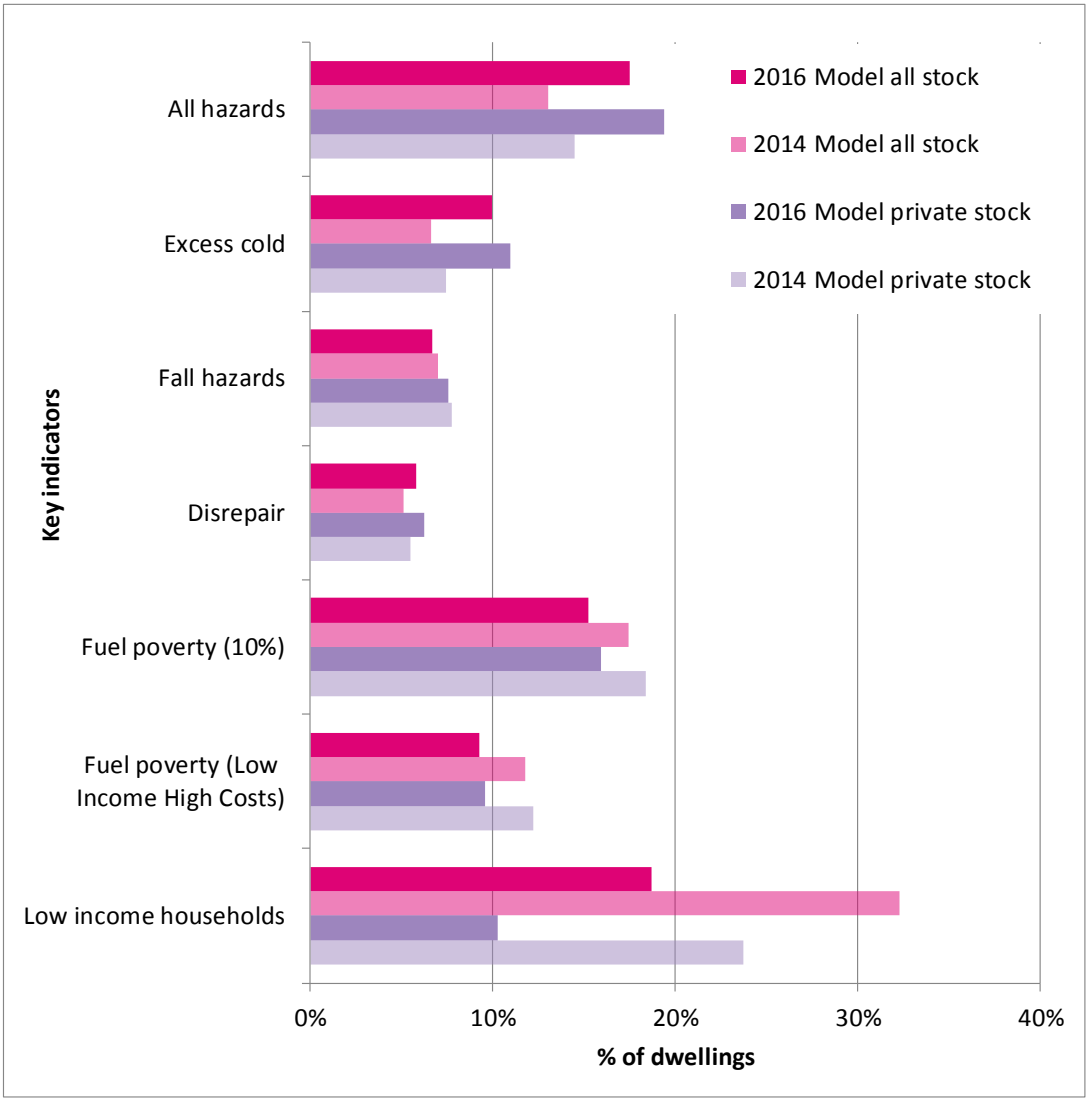
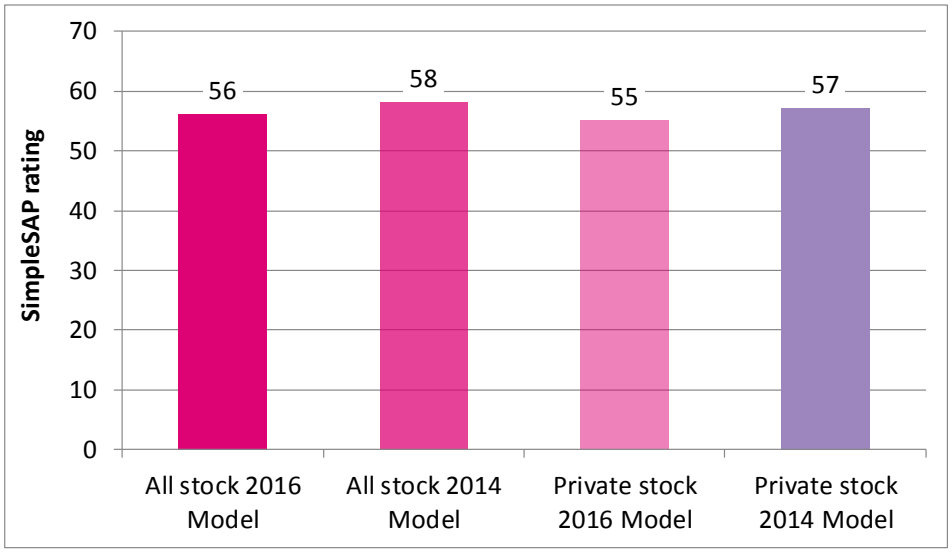


Figure 9: Average SimpleSAP ratings for all stock and private sector stock – 2016 Model compared to 2014 Model



4.3 Information relating to LAHS reporting and EPC ratings

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

Table 7 shows the total number of dwellings with HHSRS category 1 hazards in West Lancashire'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 North West using EHS 2012 data[34]. 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 7: Total number of dwellings with category 1 hazards in private sector stock and cost of mitigation

HHSRS cat 1 hazards	Total no. in the authority	Average cost per dwelling (£)	Total cost (£)
	8,121	5,803	47,127,764

4.3.2 EPC ratings in the West Lancashire private sector stock

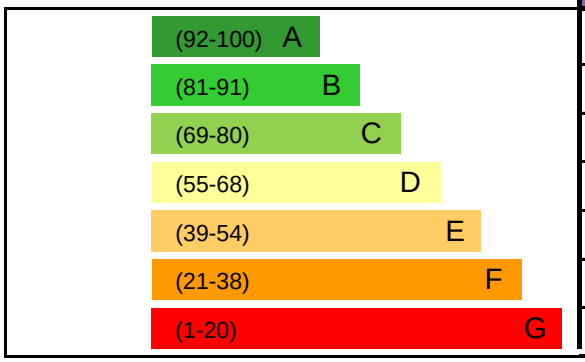
An Energy Performance Certificate (EPC) is required whenever a new building is constructed, or an existing building is sold or rented out. An EPC is a measure of the energy efficiency performance of a building and is rated from band A – G, with A representing the best performance. The EPC ratings correspond 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 West Lancashire'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 West Lancashire is 55 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 6,058 (14.5%). The distribution of EPC ratings across the bands is similar to the England figures, although West Lancashire has a higher proportion of dwellings in the F and G bands.

[34] Note that these costs are estimated based on standardised cost assumptions intended for comparison purposes. If available, local data on costs – such as grant or loan aided works – could be used; however, this type of data is usually biased. The estimates here are therefore considered as a useful starting point.

Figure 10: Number and percentage of West Lancashire's *private sector stock* falling into each of the EPC ratings bands (based on SimpleSAP)), compared to England (2012 EHS) figures *N.B. England figures report band A and B together*



	West Lancashire		2012 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	0.6%
(81-91) B	19	0.0%	
(69-80) C	5,992	14.3%	14.2%
(55-68) D	21,102	50.4%	51.0%
(39-54) E	8,728	20.8%	27.3%
(21-38) F	4,522	10.8%	5.5%
(1-20) G	1,536	3.7%	1.5%

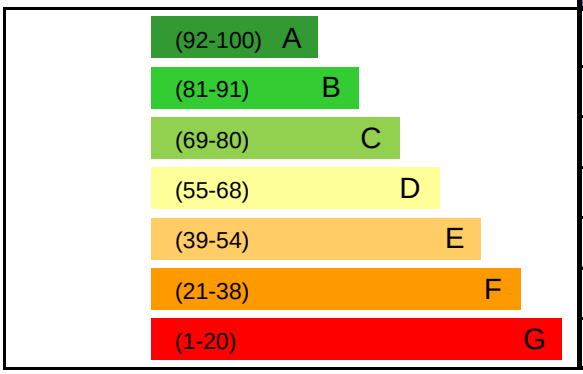
Under the Energy Act 2011, new rules mean that from 2018 landlords must ensure that their properties meet a minimum energy efficiency standard. Subject to Parliamentary approval, this minimum standard has been set at band E by 1 April 2018[35, 36]. **Map 13** shows the distribution of dwellings with an F or G EPC rating in the private rented stock. **Map D 10** provides more detail for the urban areas in West Lancashire.

[35] https://www.gov.uk/government/consultations/private-rented-sector-energy-efficiency-regulations-domestic

[36] 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.

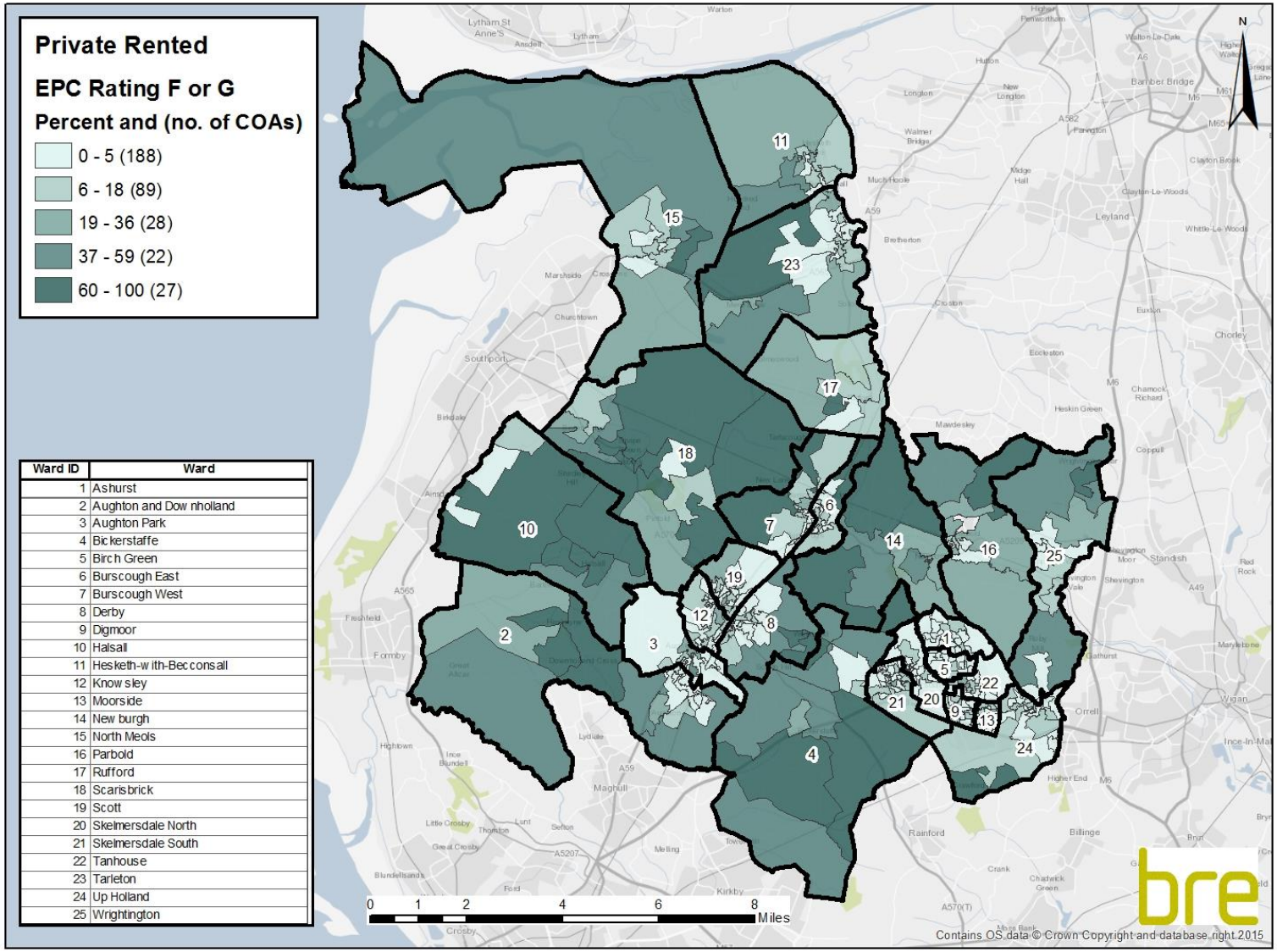
Figure 11 below shows the breakdown of SimpleSAP results into the A – G bands for the private rented stock only and compared to the figures for this tenure in England as a whole. The number of private rented dwellings in West Lancashire with a rating below band E (i.e. bands F and G), is estimated to be 660 (12.3%). Compared to England, the distribution of EPC ratings across the bands is again very similar, with a slightly higher proportion of dwellings in bands D and F, but a slightly lower proportion in band E.

Figure 11: Number and percentage of West Lancashire's *private rented stock* falling into each of the EPC ratings bands (based on SimpleSAP), compared to England (2012 EHS) figures *N.B. England figures report band A and B together*



	West Lancashire		2012 EHS England
	Count	Percent	Percent
(92-100) A	0	0.0%	1.0%
(81-91) B	7	0.1%	
(69-80) C	961	17.9%	18.9%
(55-68) D	2,645	49.4%	46.2%
(39-54) E	1,083	20.2%	24.5%
(21-38) F	505	9.4%	7.0%
(1-20) G	155	2.9%	2.5%

Map 13: Distribution of dwellings with F or G EPC ratings in the private rented stock



Ward ID	Ward
1	Ashurst
2	Aughton and Dow nholland
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4	Bickerstaffe
5	Birch Green
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15	North Meols
16	Parbold
17	Rufford
18	Scarisbrick
19	Scott
20	Skelmersdale North
21	Skelmersdale South
22	Tanhouse
23	Tarleton
24	Up Holland
25	Wrightington

5 Conclusion and recommendations

5.1 Conclusion

West Lancashire Borough Council commissioned BRE to undertake a series of modelling exercises on their housing stock. A previous report and database was prepared for West Lancashire Borough Council in 2015 which was based on BRE's 2014 Housing Stock Model. This current report, and accompanying database, has been produced using BRE's updated 2016 Housing Stock Model and describes the modelling work and provides details of the results obtained from the dwelling level model and database. The database is also provided to the council to enable them to obtain specific information whenever required.

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

- The percentage of dwellings meeting each of the key indicators for West Lancashire 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 as well as information on EPC ratings

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

- For all stock, the percentage of properties with a category 1 HHSRS hazard for excess cold is higher in West Lancashire than the North West region and England as a whole
- The private rented stock is generally worse than the owner occupied stock and considerably worse for the indicators of fuel poverty (LIHC definition) and low income households.
- The geographical distribution of excess cold hazards suggests the poorest performing properties are in the more rural wards of Newburgh, Scarisbrick and Bickerstaffe
- 12.3% of dwellings in the private rented sector are estimated to have an EPC below band E compared to 9.5% nationally. Under proposed legislation these properties would not be eligible to be rented out after 2018.

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 West Lancashire 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 DCLG's Housing Strategy Policy and ECO.

5.2 Recommendations

The current database could be enhanced to include the addition of various other sources of data (if they are available to the council). If such data were available BRE are able to integrate these local data sources into the current database.

Examples of such data are:

- **Energy Performance Certificate (EPC) data**

EPCs contain data on key dwelling energy characteristics (e.g. energy demand, excess cold, SimpleSAP) and where these are available they can be 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).

- **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 EPC data using address matching.

- **Households on benefits**

Data regarding any households in receipt of either Council Tax Support or Housing Allowance could be used to enhance the low income model, making the targeting of individual low income households more accurate.

Other data sources:

The council may have other data sources available which it is possible that BRE could integrate. Examples of such data sources are:

- **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 West Lancashire, could be used to further enhance the energy models (SimpleSAP, excess cold, fuel poverty).

Furthermore, it would be possible to provide West Lancashire with an analysis of the condition of the housing stock and its health impact, through a Health Impact Assessment. The report would also provide a cost benefit analysis of mitigating Housing Health and Safety hazards within the stock. Further assistance can be provided in the form of a Healthy Homes Advisory Service. This involves assisting the local authority in using the data from stock modelling and the health impact assessment to proactively assist vulnerable residents living in the poorest quality housing in the local authority area. The toolkit would allow West Lancashire to target the poorest quality housing and maximise the joint working opportunities with health and community groups in the area.

Appendix A Definitions of the key indicators

1. House condition indicators

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 (serious) or category 2 (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 indicators.

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 indicators:**
    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 31.5 (SAP 2005 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 SimpleSAP 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 indicators:**
    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^{o}C for the main living area, and 18^{o}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:

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

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 Benefit (CTB)).

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) framework[37]. 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 £15,050.

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

[37] https://www.gov.uk/government/collections/fuel-poverty-statistics

Appendix B Methodology for the BRE 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 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 database. The database is essentially the main output of the modelling and provides information on the key indicators 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.

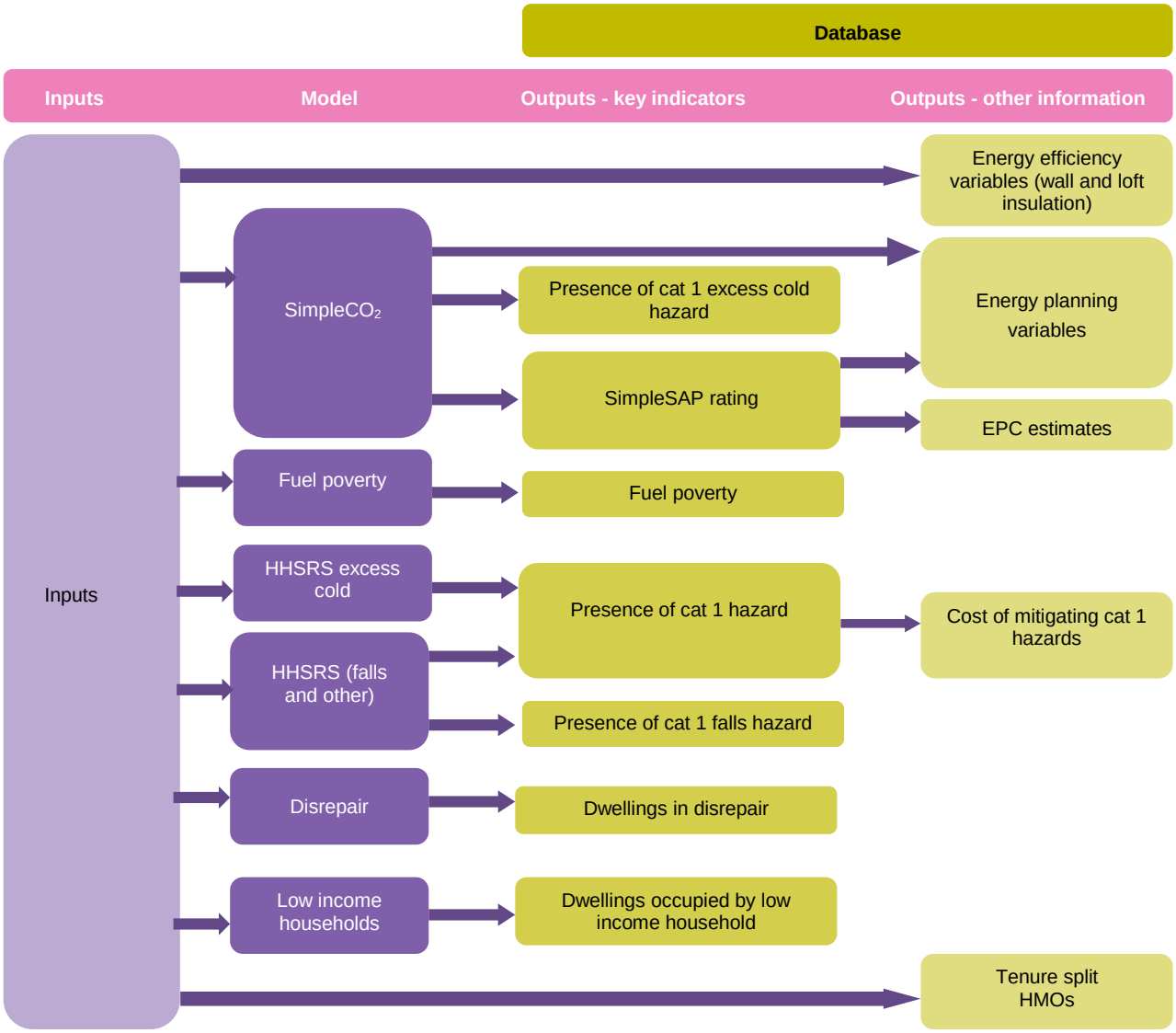
The models making up the overall housing stock modelling approach are:

- SimpleCO_2 Model
- Fuel Poverty Models
- 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 key indicators 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 SimpleCO_2 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 SimpleCO_2 Model

BRE have developed a variant of the BREDEM[38] software, named "SimpleCO_2", that can calculate a building's energy consumption and running costs 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 SimpleCO_2 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 data, other Experian data (number of bedrooms), other OS data (i.e. dwelling footprint) and data from Xoserve which indicates whether the dwelling is in a postcode which is on the gas network. As these values cannot be precisely inferred then 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[39] 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

[38] 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.

[39] 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.

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.

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 "SimpleCO_2" 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 indicator 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 Geomodelling - OS MasterMap information

The OS data has been used to generate the dwelling type. By looking at the number of residential address points it can be inferred whether the building is a house or block of flats (houses have one residential address point and blocks of flats have two or more).

Houses - where the dwelling is a house the number of other buildings it is attached to can be observed and the following assumptions made:

- If there are no other dwellings attached, the house is detached.
- If two dwellings are joined to one another, but not to any other dwellings, they are semi-detached.
- If they are attached to two or more other dwellings, they are mid terraced.
- If they are attached to only one dwelling, but that dwelling is a mid-terrace, they are an end-terrace.

Flats - if the building is a block of flats, its exact nature is determined by the number of flats in the block, the footprint area of the block, the presence of any non-residential units, and the presence of certain keywords in the address that might indicate either a purpose built block or a conversion

Additionally, by looking at the number of flats in a block, and by considering the height of the building it is possible to infer which of the dwellings will be top floor flats, which will be ground floor flats, and which will be mid floor flats.

Looking at dwelling age, although the OS data does not itself provide any information on age, it does allow reconciliation of age data within semi-detached, terraces and blocks of flats.

Where a group of buildings are all attached in some way, such as a terrace, it is logical to assume that they were built at the same time. Therefore the age of each building is replaced with the most common age among those present. Where the most common age occurs in equal numbers, this is resolved by looking at the average age of houses in the same postcode. If this is insufficient to resolve the issue, a larger area is considered.

In a similar manner, the wall type can also be reconciled to allow for the fact that dwellings built together will be of the same construction method.

Figure B. 2 and **Figure B. 3** below show how the initial base data is adjusted using the OS data to produce more consistent and reliable results.

Figure B. 2: Dwelling level map showing the base data, prior to using the OS data

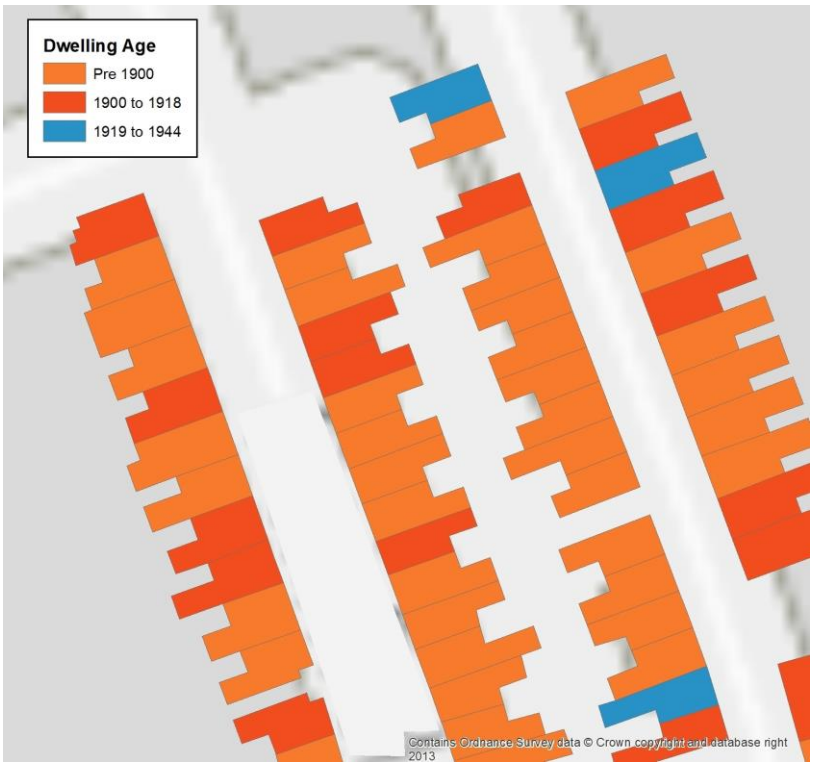
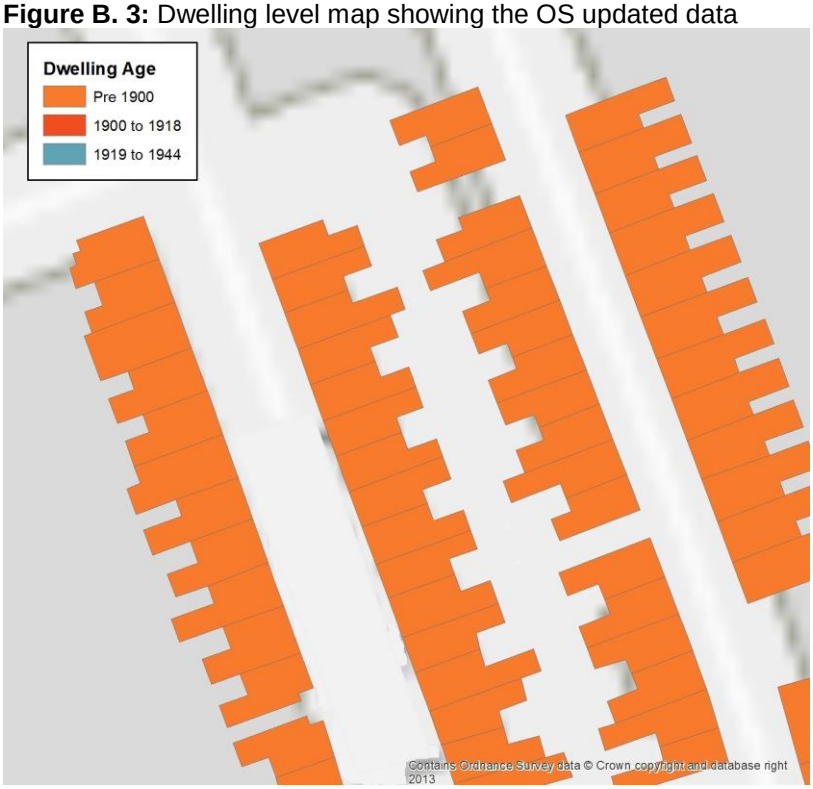


Figure B. 3: Dwelling level map showing the OS updated data



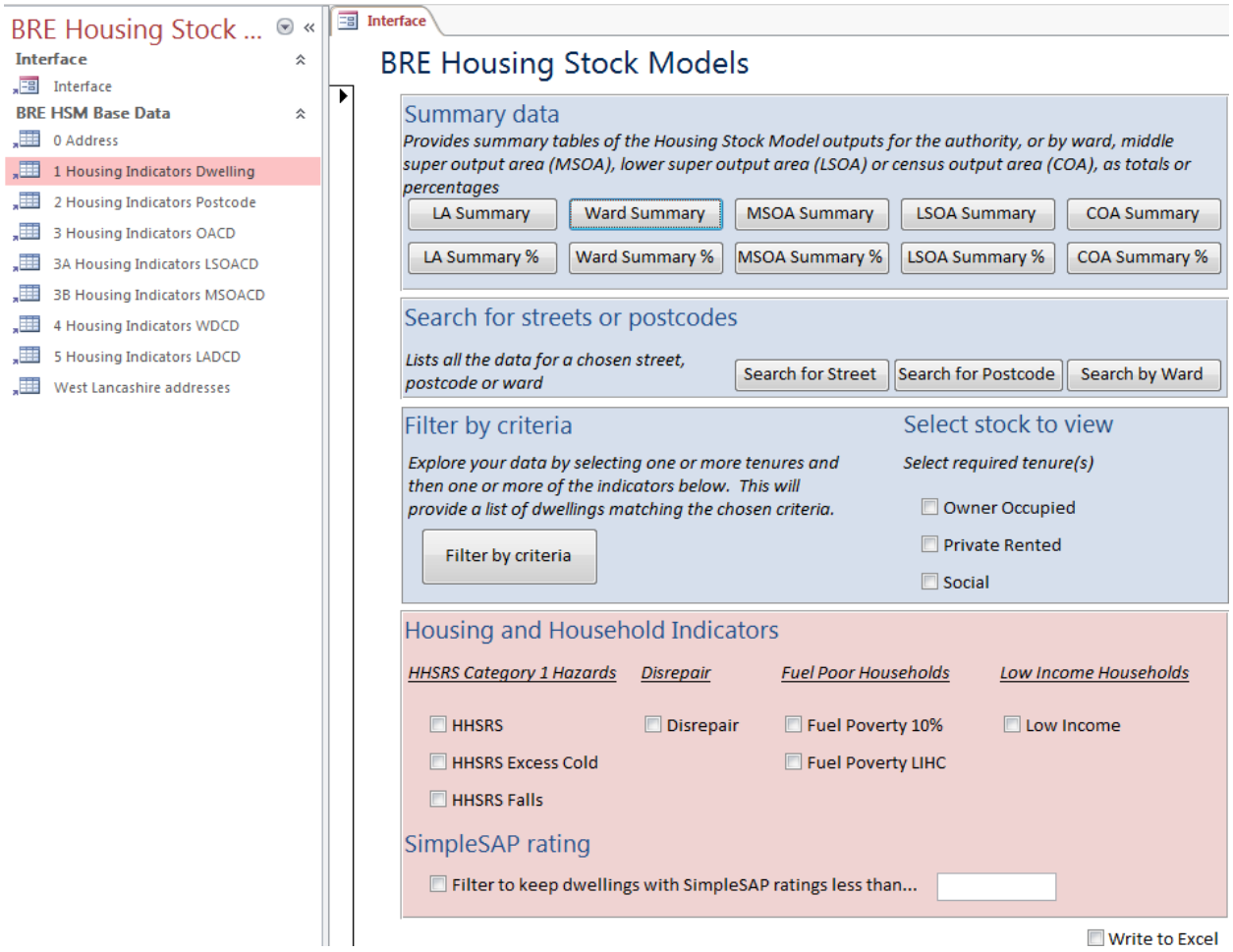
Appendix C Using the BRE Dwelling Level Housing Stock Database

The BRE Dwelling Level Housing Stock Database is the final output of the overall stock modelling approach described in **Section 3** and **Appendix B**. The database has been designed to provide local authorities with a number of different options for summarising or investigating their data and generating lists of properties of interest. This Appendix provides details of how to use the database.

C.1 Overview

The database will automatically open on the interface screen as shown in **Figure C. 1** below.

Figure C. 1: BRE dwelling level housing sock database – opening interface screen



On the left hand side of the database is a vertical column known as the “navigational pane”. Under the heading “BRE HSM Base Data” there are 8 tables which hold the BRE housing stock model data. The tables are as follows:

Table C. 1: Summary of information provided in each table in the database

Table Name	Description
0 Address	Address details (building names, house numbers, postcodes), COA, Ward, LSOA, MSOA for each address
1 Housing Indicators Dwelling	Dwelling level housing stock model data and Experian tenure variable[40]. SimpleSAP results: score out of 100 All other indicators: 0 = pass the standard, 1 = fail
2 Housing Indicators Postcode	Summary information and statistics for each of the aggregated levels specified. 5 “stock levels” are provided – all, private, owner occupied, private rented, social
3 Housing Indicators COA	
3A Housing Indicators LSOA	
3B Housing Indicators MSOA	
4 Housing Indicators Ward	
5 Housing Indicators LA	

C.2 Using the database

The rest of the screen is the main interface which has been developed with a number of standard queries that will present the user with information likely to be of use when reviewing data in order to design a housing stock strategy. There are 3 main sections to the interface: “Summary data”, “Search for street or postcode” and “Filter by criteria”. These sections are described in more detail below.

C2.1 “Summary data”

These options allow the user to generate summaries of their data at different levels of aggregation. The different levels of aggregation are;

- Local authority
- Ward
- MSOA
- LSOA

[40] If the Experian tenure variable has been purchased.

- COA

There are two types of summaries available at each level - totals and percentages:

- Totals give the user the total number of dwellings that fail a particular standard, for example, the total number of dwellings that have a HHSRS category 1 hazard in the authority.
- Percentages tell the user the percentage of dwellings that fail a criterion, for example, the percentage of dwellings suffering from HHSRS category 1 excess cold hazards.

C2.2 "Search for streets or postcodes"

These options allow the user to search for particular areas, either by street name or postcode. By clicking on a search button the user will be asked to type in either a street or postcode. A table will then be shown which provides a list of all dwellings in the street or postcode requested.

If the full name of the street is not known, wildcard characters can be used to search for close matches. A wildcard character is one that can stand in for any other letter or group of letters. Access uses an asterisk (*) as the wildcard character. For example entering "Abbey*" will return any street name starting with "Abbey", for example, "Abbey Road", "Abbey Close", "Abbeyfield" etc. Wildcard characters can be used at both the beginning and the end of the search text. For example, by entering "*Abbey*" would find "Abbey Road", "Old Abbey Road" etc.

The street names used are those provided in the Local Land and Property Gazetteer. It can sometimes be the case that a street name can be written differently across databases (e.g. "Rose Wood Close" or "Rosewood Close"). If a road name does not appear to be present, try using wildcard characters to check for alternatives.

The postcode search facility works in a similar manner. Entering "BN15 0AD" will find all dwellings in that exact post code, but entering "BN15*" will find all dwellings whose postcode begins with BN15.

Note: always close the results of an existing search before starting a new one. Clicking the button when the results of an existing search are still open will simply return to the results of that search. A search, or any other table, can be closed by clicking the "x" in the top right corner of the table window.

C2.3 "Filter by criteria"

This section allows the user to select dwellings based on one or more criteria / key indicators of interest.

First, the user needs to select which tenure(s)[41] they are interested in by using the "Select stock to view" on the right hand side of the box.

The default setting is that no tenures are selected, so the user will need to select at least one in order to get any results. Multiple tenures can be selected, so for the results for all the private stock select both owner occupied and private rented.

[41] If the Experian tenure variable has not been purchased this section is locked and only private sector stock is shown.

Once one or more of the tenures has been selected, choose one or more of the indicators of interest either by selecting an indicator e.g. HHSRS Cat.1 hazards will return dwelling with fail HHSRS, or for SimpleSAP enter a rating to select dwellings on and below the rating.

Once a tenure(s) and indicator(s) have been selected clicking the ‘Filter by criteria’ button will return the addresses matching the chosen criteria.

As with the searches, close the results of an existing selection before starting a new one.

C.3 Creating Excel files

Whilst it is possible to copy the data from any of the queries accessed from the interface screen, an option has been added to make this process easier. To output results to Excel click the “Write to Excel” check box at the bottom right of the screen. As long as this box is checked, clicking any of the summary data, search or criteria selection buttons will cause the resulting data to be written to Excel instead of being displayed.

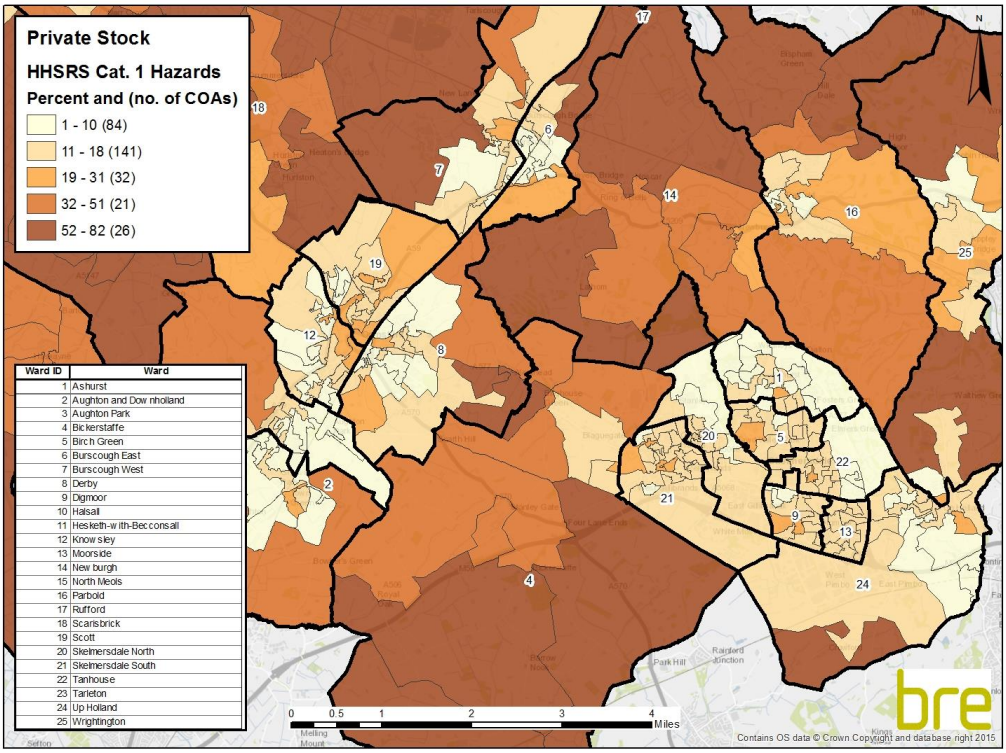
If this option is selected when any button is clicked the database requests a format for the output data. Once the appropriate file format is selected, click “OK” and choose a file name and location and click “OK” to save the file.

This function means it is possible to rapidly export summary tables for inclusion in reports, or lists of dwellings which can be used to target improvement programmes.

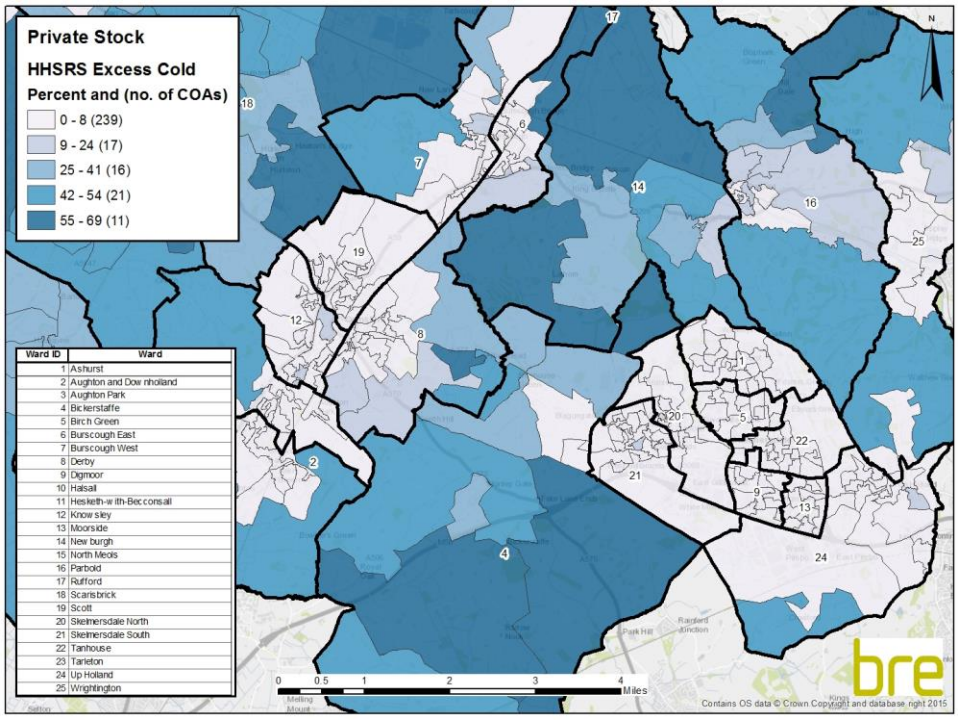
Appendix D Additional maps

This appendix provides close up maps of some of the more urban area of West Lancashire. These maps show the clear urban – rural divide in many of the housing indicators. The larger maps included above in the report do not always allow for the appreciation that smaller and denser Census Output Areas (COAs) in urban areas are very different in their hazards to the surrounding rural COAs which are larger and are immediately more eye-catching.

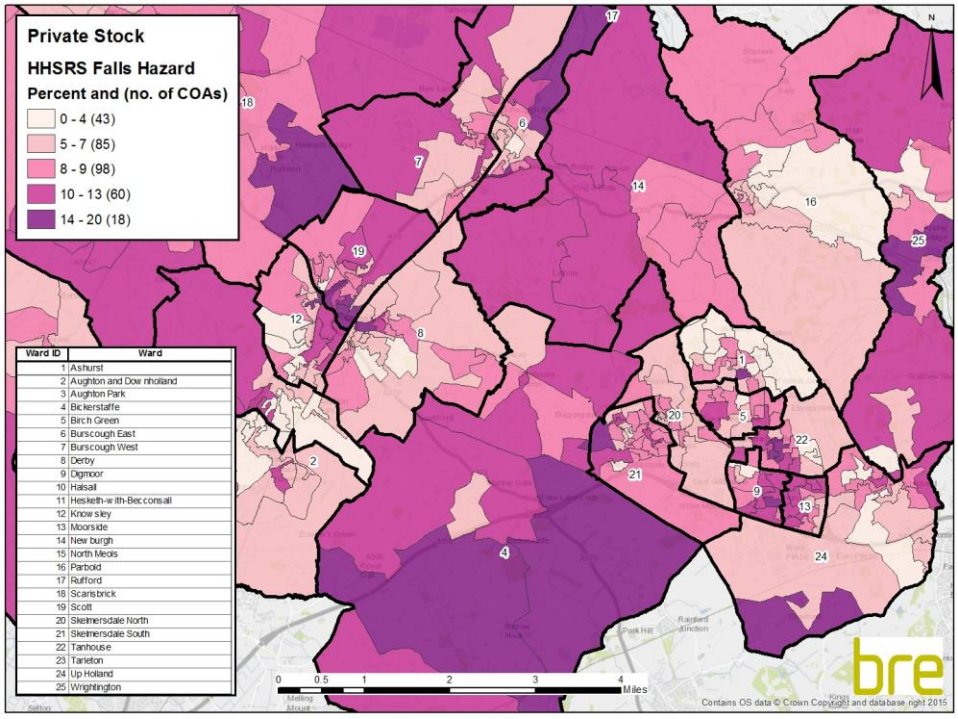
Map D 1: Urban West Lancashire category 1 hazards – private stock *(click here to return to main map)*



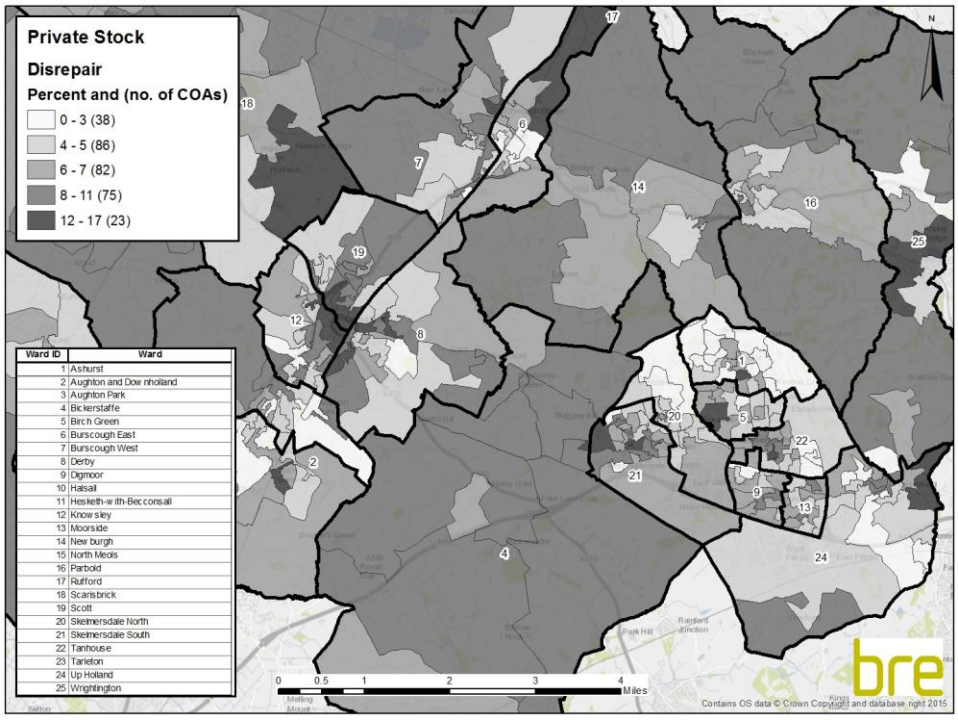
Map D 2: Urban West Lancashire households with excess cold – private stock *(click here to return to main map)*



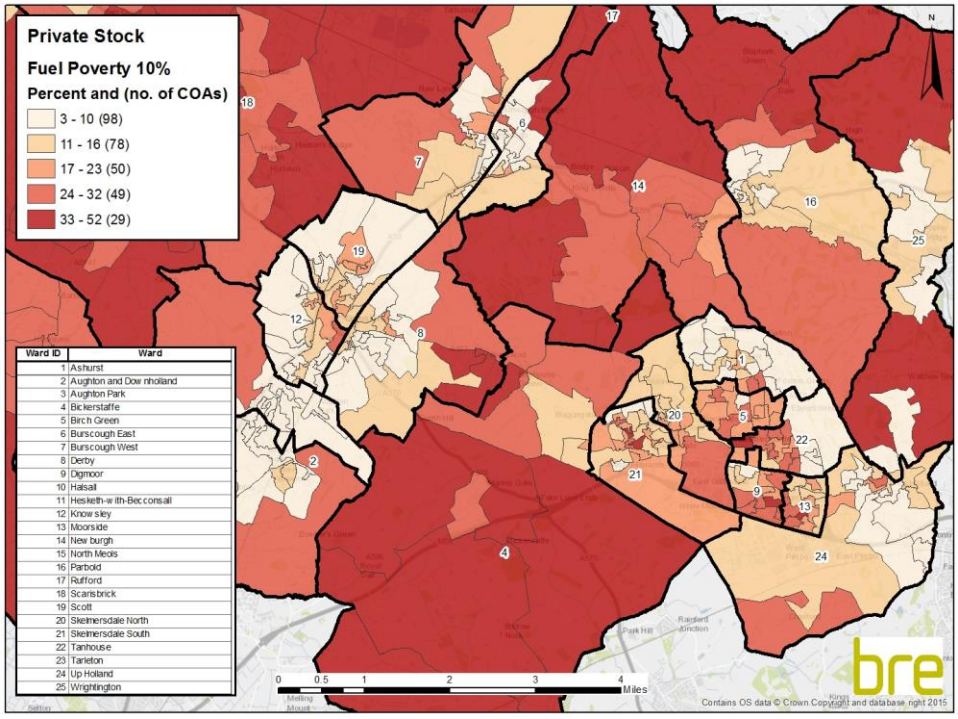
Map D 3: Urban West Lancashire households with falls hazards – private stock *(click here to return to main map)*



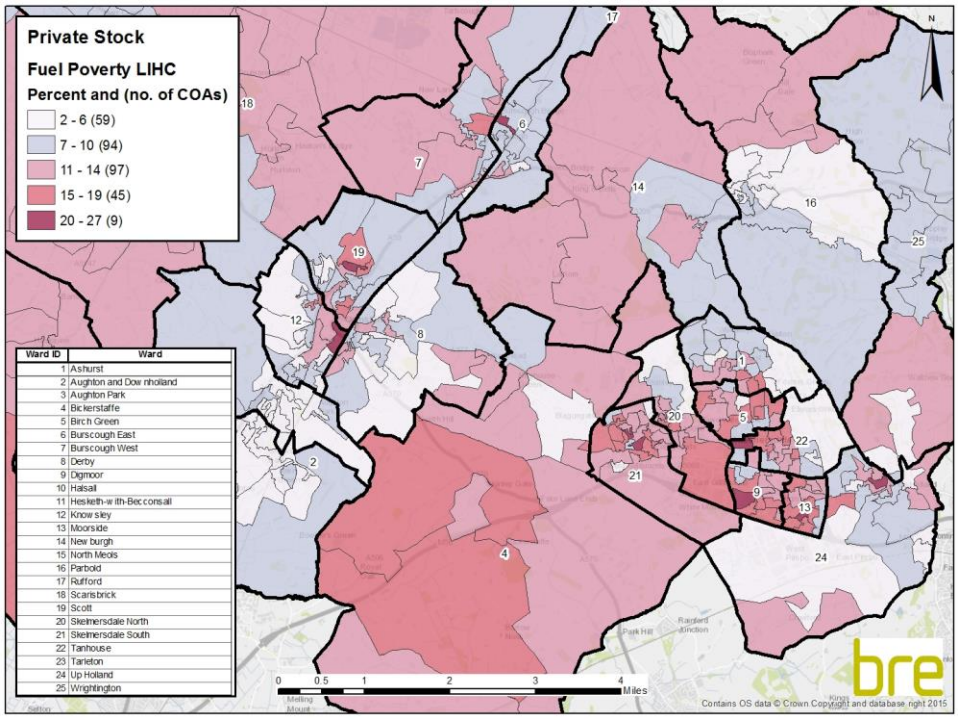
Map D 4: Urban West Lancashire households in disrepair – private stock *(click here to return to main map)*



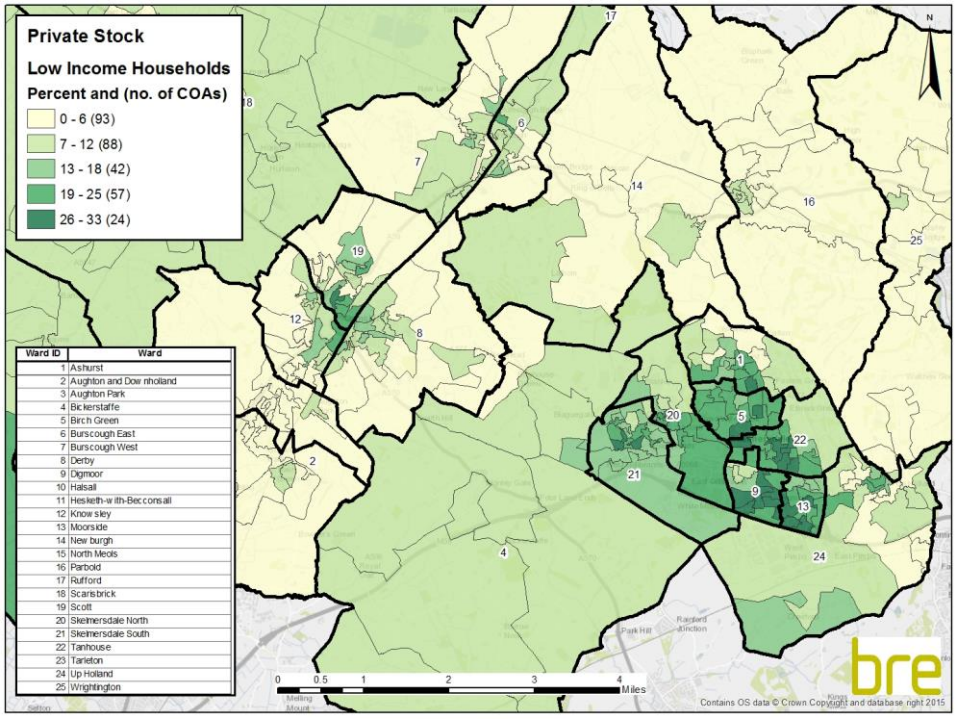
Map D 5: Urban West Lancashire households in fuel poverty (10% definition) – private stock *(click here to return to main map)*



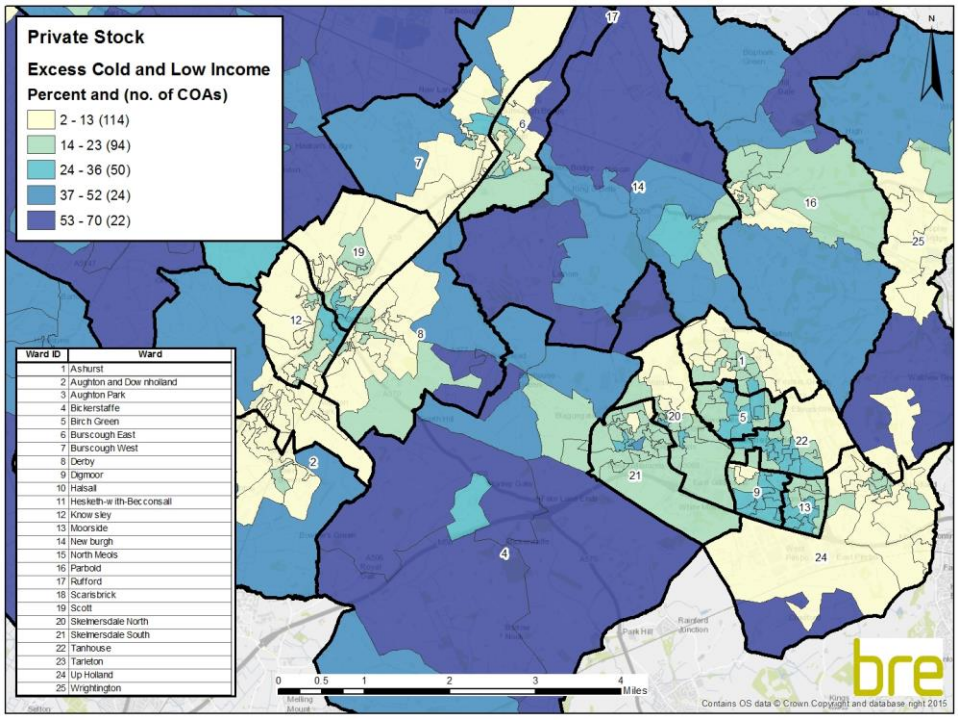
Map D 6: Urban West Lancashire households in fuel poverty (LIHC definition) – private stock *(click here to return to main map)*



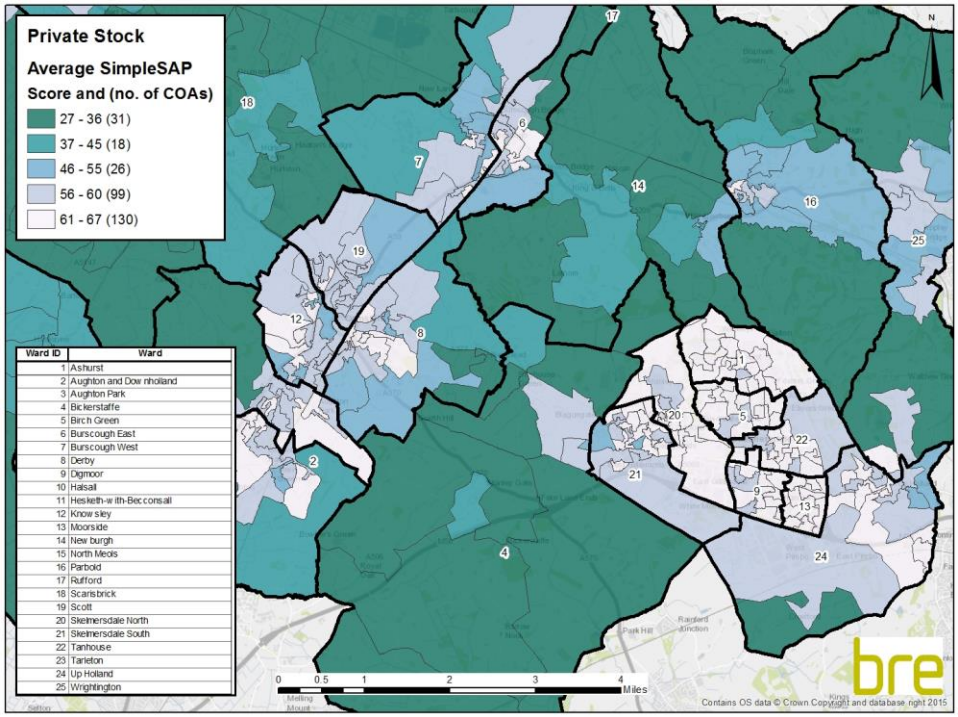
Map D 7: Urban West Lancashire households in low income – private stock *(click here to return to main map)*



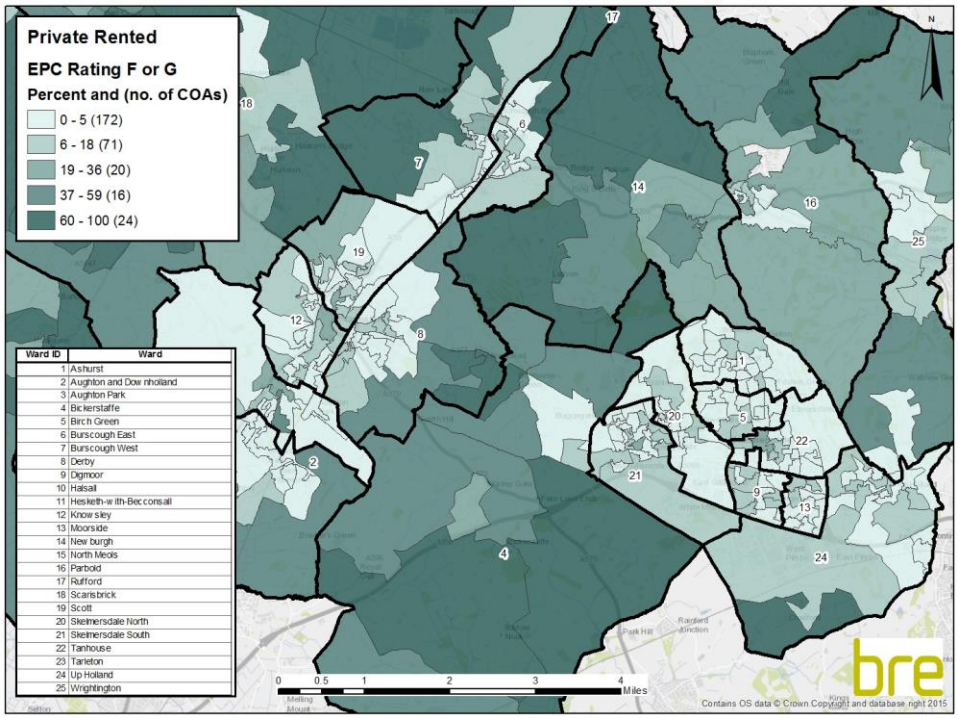
Map D 8: Urban West Lancashire households with excess cold and in low income – private stock *(click here to return to main map)*



Map D 9: Urban West Lancashire average SimpleSAP – private stock *(click here to return to main map)*



Map D 10: Urban West Lancashire households with EPC ratings F or G – private rented stock *(click here to return to main map)*



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
DCLG	Department for Communities and Local Government
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 Department for Communities and Local Government (DCLG). 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	Health Impact Assessment A formal method of assessing the impact of a project, procedure or strategy on the health of a population
HMO	Houses in Multiple Occupation 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 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
HSM	Housing Stock Model Desktop based modelling used to determine the condition of the housing stock
Jenks' Natural Breaks	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

JSNA	Joint Strategic Needs Assessment An assessment of the current and future health and social care needs of the local community
LACORs	Local Authority Coordinators of Regulatory Services - now renamed Local Government Regulation
OS	Ordnance Survey
SAP	Standard Assessment Procedure – this is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings
SimpleSAP	A simplified version of the SAP model that produces an output broadly comparable to SAP. The SimpleSAP model is distinct from both full SAP and RD SAP in that uses a smaller, simplified set of inputs.
Xoserve	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.

Report Ends